THE AMPHIPOD FAMILY MELITIDAE ON THE PACIFIC COAST OF NORTH AMERICA: PART II. THE *MAERA* - *CERADOCUS* COMPLEX.

T. Krapp-Schickel[1] & N. E. Jarrett[2]

ABSTRACT

In the North American Pacific coastal marine region, from Alaska to Baja California, species of Melitidae (Hadzioidea) belonging to the *Maera-Ceradocus* complex were studied and the following genera treated: *Maera* Leach (sensu stricto), *Quadrimaera* Krapp & Ruffo, *Lupimaera* Barnard, *Anamaera* Thomas & Barnard, and *Maera* (sensu lato). Within *Maera* sensu stricto, a *M. danae* - clade [with *M. danae* (Stimpson), *M. fusca* (Bate), *M. loveni* (Bruzelius) and ***M. nelsonae*** n. sp.] as well as a *Maera similis* - clade [with *M. similis* Stout, ***M. bousfieldi*** n. sp., and ***M. jerrica*** n. sp.] could be found and a key constructed for all members. One probable new species (only one young female) belongs to the still unravelled group of *Maera* species sensu lato, around *M. rathbunae* Pearse, but full description awaits further material. The genus *Meximaera* Barnard is withdrawn and *Meximaera diffidentia* returned to *Maera* (sensu lato) *diffidentia* Barnard, with *Maera caroliniana* Bynum & Fox as junior synonym. Within *Quadrimaera* Krapp & Ruffo we could recognize a *Q. reishi* - clade [*with Quadrimaera reishi* (Barnard) nov. comb., *Q. chinarra* (Barnard) nov. comb. and ***Q. carla*** n. sp.] we provisionally attribute the former *Maera vigota* Barnard. The large genus *Elasmopus* needs revision as it is undoubtedly not monophyletic; at the moment we describe only some material with (more than one) species of *Elasmopus* prope *antennatus* (Stout). Within genus *Ceradocus* we found only *Ceradocus spinicauda* (Holmes) in the study region. The former *C. torelli* (Goës) here becomes the type of ***Wimvadocus*** n. gen. and the former *Ceradocus baffini* Stephensen is transferred to genus *Megaceradocus* Mukai.

INTRODUCTION

In 1977 Bousfield revised the old Gammaridae by establishing a superfamily Gammaroidea with *Gammarus* - like freshwater inhabitants, and a superfamily Melitoidea (now Hadzioidea) consisting of the family Melitidae containing mainly marine *Melita*- and *Maera* - like genera (with distinct inner lobes on their lower lips), and the family Hadziidae composed of brackish and fresh water species (lacking these inner lobes).

Barnard & Barnard (1983) still discussed groups within the "Gammaroids", without giving them unambiguous scientific names. Thus, on p. 137 they describe the Hadzioids (Melitoids) with "Hadziids" containing "the *Melita* group", distinguish a "greater *Ceradocus* group", which contains "the *Ceradocus* group" with *Anelasmopus, Elasmopoides, Paraweckelia* from the complex of genera around *Ceradocus* , *Elasmopus* and *Maera* .

Jarrett & Bousfield (1996) presented a detailed revision of the genus *Melita* (with about 60 species then known) based on material from the North American Pacific coast. The present study deals with species belonging to *Maera* (with about 80 species known at the moment) and *Ceradocus* (about 25 nominal species) from the same region.

The genus *Ceradocus* was first described by Costa (1853) for *C. orchestiipes* from Naples, and *Maera* was erected by Leach (1814) for *Cancer grossimanus* Montagu, 1808, from English coasts. This species complex retains a magniramous third uropod, in contrast to the "melitids" with dispariramous third uropods. Whereas *Ceradocus* still has a triangular inner plate on the first maxilla, with many setae on the inner margin as well as a densely setose inner plate on the second maxillae, *Maera* has a slender inner plate on the first maxilla, and (on both maxillae) no setae on the inner margins of the inner plate. Furthermore, all species of *Ceradocus* have a reduced last article of the mandible palp, while in *Maera* all conditions (article 3 longer, equal or shorter than article 2) are found. The genus *Elasmopus* is closely related to *Maera* (and certainly also needs revision, being polyphyletic at the moment), but is defined by the special falcate shape of mandibular palp article 3, and generally has a much more robust habitus.

The first eastern Pacific amphipods were described by Dana (1853) from Puget Sound. Also Stimpson (1856a,1857,1864), Calman (1898) and Walker (1898) studied the Puget Sound region. Boeck (1871), though working mostly with North Atlantic material, treated animals from Californian coasts. At the end of the 19th

[1]Museum A. Koenig, Adenauerallee 160, D-53113 Bonn, Germany
[2] 83 Havelock St., Ottawa, Ontario, Canada K1S 0A4

century the great carcinologists stopped dealing with Crustacea as a whole in one work, and specialisation began. Holmes (1908) worked exclusively on Californian amphipods and Stout (1912, 1913) described 18 new species from this region. C. R. Shoemaker, from 1916 to his death in 1958, and posthumously, published many papers on eastern Pacific amphipods; he summarized arctic Alaskan records in 1955. Alderman (1936) worked on the fauna of Moss Beach; Schellenberg (1936) on specimens from the coast of British Columbia; and Thorsteinson (1941) on material from Puget Sound. Wailes (1931) and Austin (1985) summarized records from British Columbia.

The region of British Columbia was intensively covered by Bousfield (1958, 1977, 1978, 1979, 1981a,b, 1982, 1983, until the present), and by Mills 1961, 1962. Bousfield and colleagues published several papers on Pacific amphipods in "Amphipacifica", 1994 to 1997, continued in the present "revived" series of this journal of aquatic systematic biology. Hurley (1963) studied Californian material. Barnard (1954) commenced his numerous monographic studies in the North American Pacific region. Following his field survey of rocky intertidal amphipods (1969a) he continued publications on the Pacific fauna, even after his transfer to the North American Atlantic coast. For an overview of western North Pacific literature see Kozloff (1987: 346-348) or Jarrett & Bousfield (1996: 5). For a general faunistic overview, see Light (1954) or Smith & Carlton (1975).

The present study treats material collected along the whole Pacific coast of North America, from Point Barrow (Alaska) to Cabo San Lucas (Baja California). It encompasses the Alaska Current entering from the Arctic Ocean, the North Pacific Drift, the Californian Current with cold-temperate water, the warm-temperate region defined between Pt. Conception, California and Bahia Magdalena, Baja California, and the coastal part between Bahia Magdalena and Cape Lucas with strong tropical affinities, with currents leading later into the E-W and W-E equatorial currents of the Central Pacific.

ABBREVIATIONS USED IN TEXT AND FIGURES:

A1,2 = antenna 1, 2
art = article
b = breadth
CMNC = Canadian Museum of Nature, Ottawa
Cx = coxa
Ep 1,2,3 = epimeral plates 1,2,3
Gn 1,2 = gnathopod 1, 2
l = length
Md = mandible
Mx 1, 2 = maxillae 1, 2
Mxp = maxilliped
P3-7 = peraeopods
Pls = pleon segment
T = telson
U1,2,3 = uropods 1,2,3
Us = urosome segment
USNM = Smithsonian Institution, Washington

MATERIAL AND METHODS:

Fluid preservative is 70% alcohol with 3% propylene glycol. Microscope slides are mounted in polyvinyl lactophenol, stained with lignin pink. Illustrations have been photographically reduced from inked line drawings on vellum, approx. 19 x 29 inches.

SYSTEMATICS

Family Melitidae Bousfield, 1973

Bousfield, 1973: 61; 1977: 299 (revised); 1982: 281; Jarrett & Bousfield 1996: 4; Lowry & Fenwick, 1983: 201.

For family diagnosis, see Jarrett & Bousfield (1996: 5).

The most plesiomorphic character states within the large species group of *Maera* (sensu lato), are displayed by *Maera othonis* Milne-Edwards,1830 (now *Othomaera* fide Krapp-Schickel 2000). These include subchelate gnathopods subequal in shape and size, without clear sexual dimorphism (at least after Sars (1895), with rounded propodus hind margins lacking a defined palmar corner; their P3-7 dactyli are simple, the basis of P3-7 slender, U3 rami subequal and lanceolate, and the telson is deeply cleft,with short spines. The genus *Maera* Leach has lost the maxillar setae on the inner margins compared to the basic gammarid "Bauplan" and has specializations on many other parts of the body. In *Ceradocus*, the bathyal species *torelli* and *baffini* (in Barnard & Barnard 1983 still within the genus, but now separated and into other genera) avoided the need of specialization by retirement into the presumed less competitive depths, while retaining many plesiomorphic characters.

The genus *Elasmopus* has mainly tropical members, and 5 species are known from California (Barnard 1969a:117-121). *Ceradocus* is reported from circumtropical, mainly Indopacific localities (7 species from the Atlantic, one from the Mediterranean). The *quadrimana*-complex (now *Quadrimaera*, see Krapp-

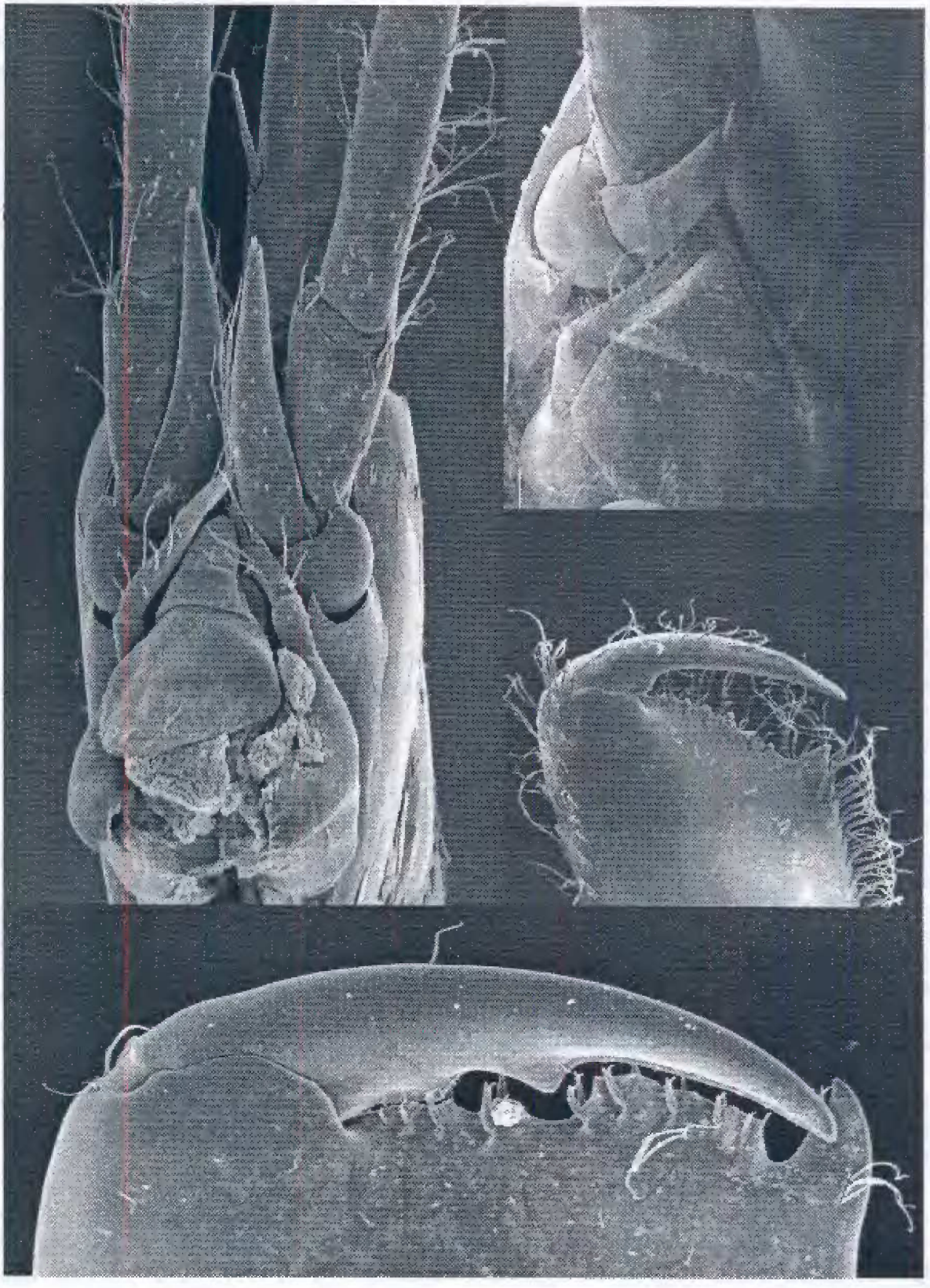

Fig. 1. SEM pictures of mouthpart-bundle and male Gn2: left and below ***Quadrimaera serrata***, above right and right-middle: ***Maera danae***.

Schickel & Ruffo, 2000) is also mainly tropical, with its center of evolution apparently in the West Pacific and only 3 species from the east coast. The *grossimana* complex (=*Maera* sensu stricto) contains east Pacific inhabitants, but was previously unknown from the western Pacific.

For decades the large group of "*Maera* sensu lato" species has never been tackled, as characters seemed to have developed independently in many directions. But, in addition to describing and drawing morphological features, we are now able to make SEM pictures, and we learned a lot by plotting many of the characters together in a matrix for computer cladistics. Both methods together helped reveal that species similar to *Maera grossimana* (Montagu) always have the same mix of characters: reniform eyes, Md palp art 1 obliquely lengthened or tooth-shaped, A1 flag. acc. short, and (the most striking one) many setae on the outer margin of Gn2 dactylus, inner margin smooth (Fig. 1 middle right). In contrast, all species similar to *Gammarus quadrimanus* Dana have round eyes, a rounded Md palp art 1, long A1 flag. acc., and only 1 seta on Gn2 dactylus outer margin, inner margin excavate or with humps (Fig. 1). This result led to the decision to erect a separate genus *Quadrimaera* for a quarter of all extant *Maera* sensu lato species, after defining the characters of *Maera* sensu stricto Leach (see Krapp-Schickel & Ruffo 2000).

The character of more than one setae on the outer margin of Gn2 dactylus also divides the genus *Niphargus* into two groups, and within the *Melita* group it is present (to varying degree) in all other genera, while absent in *Melita* s. str. It would be interesting to know the function of these setae. Scanning electron pictures of the mouthpart-bundle of *Maera* sensu stricto, and *Quadrimaera* species, reveal that in *Maera* species the mandible corpus is short and stout, art 1 is mediolaterally inserted, and the articulation of art1 and art2 is an angled knee, thus directing the palps toward each other (Fig. 1 above right). Ventral to this "knee" is a more or less developed tooth, that probably stabilizes the articulation. In *Quadrimaera* the mandible corpus is lengthened at the insertion of the palp (Fig. 1 above left), the palp continues this protuberance in a linear fachion, and all articulations are straight . This may be connected with the different biotopes and different feeding habits of the two genera: *Quadrimaera* species are inhabitants of rocky intertidal habitats and probably feed on algae or their epiphytes, while *Maera* are found in sandy-muddy regions of less turbulent water and should be filter feeders.

Another synapomorphy of *Quadrimaera* seemed to be the "spur" on the outer margin of the peraeopod dactyli. But in this paper we will present Pacific members of *Maera* sensu stricto which also possess so-called "bifid" peraeopod dactyli. Ledoyer described *Maera* (sensu lato) *multispinosa* (1982, p. 530-531, fig. 199) from Madagascar with bifid dactyli and the character is reported from *Maera* (sensu lato) *ascensionis* K. H. Barnard, 1932 p. 214 fig. 132 = *Maera atlantica* Mateus & Mateus, 1986, p. 158 fig. 21-23, found in the Central Atlantic. The figures illustrating *Maera grossimana* in Karaman-Ruffo 1971 show a serration on the outer margin of peraeopod dactyli; the step in developing a bifid dactylus [or trifid, as in *Quadri-maera viridis* (Haswell, 1879)] does not seem large. This character could have developed independently in many groups; it is present in animals living in shallow and rocky biotopes, and could be connected with grasping ability.

Maera group

For comparison of genera belonging to or near the *Maera* group see Barnard & Barnard (1983: 139).

NORTH PACIFIC GENERA OF THE *MAERA* GROUP

Diagnosis: Eyes rounded, oval or reniform. Md palp art 1 distally rounded, obliquely lengthened or toothed; art 3 slender (versus falciform in *Elasmopus*), shorter, equal or longer than art2. Mx1 inner plate a slender lobe (vs. triangularly widened in *Ceradocus*); Mx2 inner plate on inner margin only distally scarcely beset with setae (vs. strongly setose on whole inner margin in *Ceradocus*). Gnathopod 1 not sexually dimorphic (vs. dimorphic in *Melita* group). Gnathopod 2 subchelate, dactylus with 1 or with many setae on outer margin. Peraeopod 5-7 dactyls simple or bifid. Uropod 3 aequiramous, outer ramus article 2 rudimentary or lacking. (see key to genera, p. 28).

Maera Leach (sensu stricto)

Maera Leach, 1814: 403; 432 (*Cancer grossimanus* Montagu, 1808).

Diagnosis: Eyes oval to reniform (vs. round in *Quadrimaera*). A1 acc.flag < 0.5 length of flagellum (vs. > 0.5 in *Quadrimaera*). Md palp art 1 distally obliquely lengthened, often pointed and toothed, (vs. rounded in *Quadrimaera*), art3< art2. Gn2 propodus palm oblique, palmar corner defined, about 120-150° (vs. 90° in *Quadrimaera*, 180°=undefined in *Othomaera* Krapp-Schickel, 2000). Gn2 dactylus on outer margin beset

(continued on p. 29)

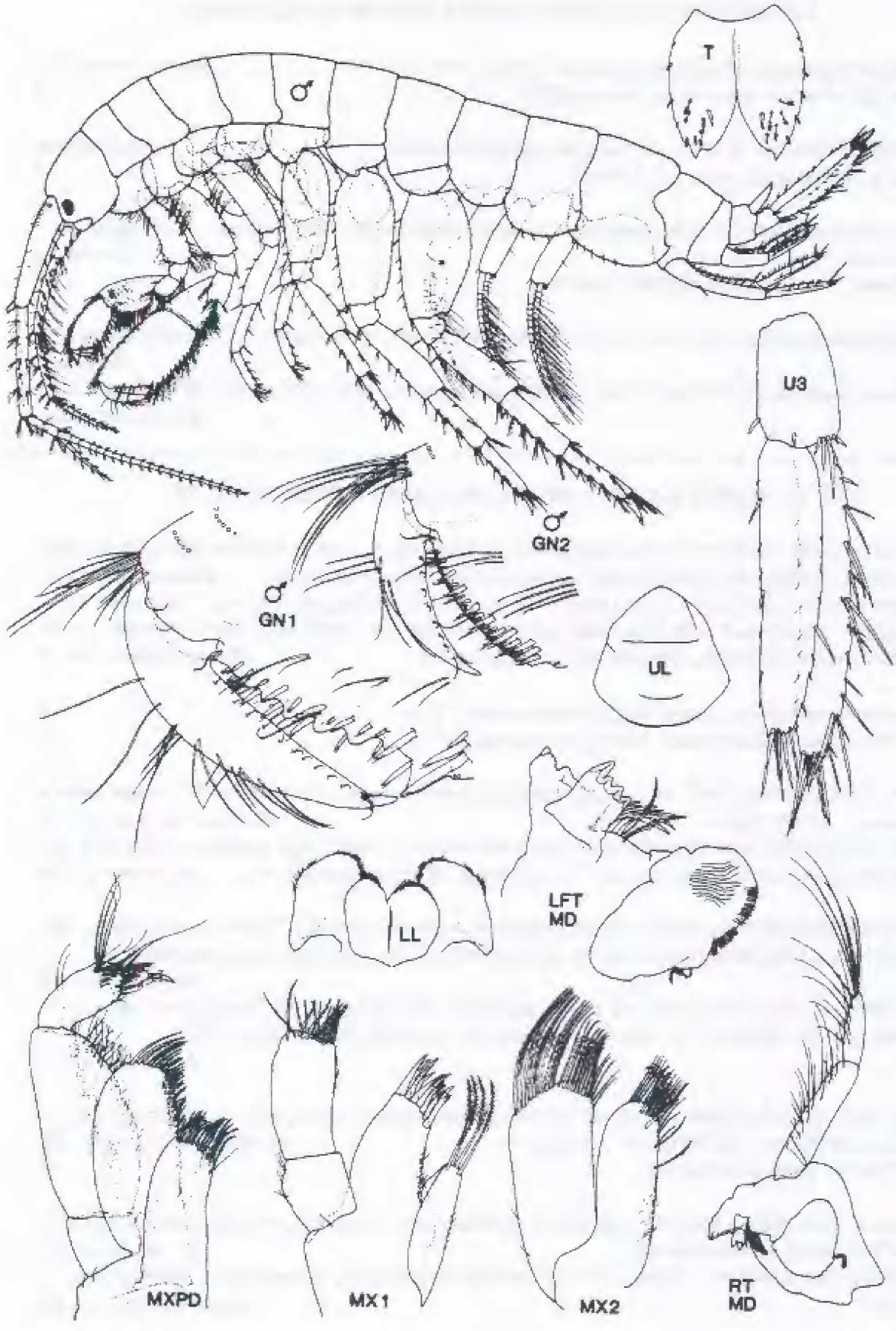

Fig. 2. ***Maera*** cf. ***danae*** (Stimpson). Male 12mm, Montague Island, MacLeod Harbor, Gulf of Alaska.

KEY TO NORTH PACIFIC GENERA OF THE *MAERA* GROUP

1. Gn2 dactylus many setae on outer margin, palmar corner ca 120°..... *Maera* sensu stricto
   Gn2 dactylus only one seta on outer margin 2

2. Gn2 propodus male ,female, quadrangular, palmar corner 90°..... *Quadrimaera*
   Gn2 propoduslarge, wide, not as above 3

3. U3 rami shortened, 1.5 times longer than wide, not much longer than peduncle; A1,2 flagellum reduced..... *Lupimaera*
   U3 rami about 2-3 times peduncle-length..... .4.

4. Body pubescent; Ep1,2,3 posterodistally serrate, propodus Gn2:Gn1 male = 6-7, Gn2 asymmetrical ..... *Anamaera*
   Body smooth; Ep1,2,3 posterodistally with upward-curved tooth; propodus Gn2: Gn1 male about 3:2. ..... *Maera* (sensu lato)

KEY TO NORTH PACIFIC SPECIES OF *MAERA* (SENSU STRICTO)

1. Ratio propodus Gn2:Gn1 <2; U3 ratio ramus:peduncle >2; T lobes laterally rounded, distally each without or with small subdistal notch and one spine; Md palp art3>art2 . . . *Maera danae* clade
Ratio propodus Gn2:Gn1 >2; Gn2 basis swollen; U3 ratio ramus:peduncle <2; T lobes laterally straight, distally each with clear distal incision and one spine sitting in incision, a second one on outer margin subdistally; Md palp art3 subequal to art2 ..... .*Maera similis* clade . 5.

2. Gn2 propodus palmar corner with prominent strong spine ..... .3.
Gn2 propodus palmar corner without prominent spine ..... .4.

3. P5-7 basis posteroventrally with sharp angle; Ep3 posteroventrally also with ca 90° corner; spine in telsonic notch small..... ***M. nelsonae*** n. sp. (p. 34)
P5-7 basis posteroventrally without corner, harmonically rounded; Ep3 posteroventrally with upward curving tooth; spine in telsonic notch strong, surpassing telsonic tip . . . . .***M. loveni*** (p. 34)

4. Telson distally without or with minute notch, without distal spine; P5-7 basis posterodistally widened but not lengthened; Cx1 anterior corner rounded.; U1 reaching end of peduncle U3 . . . . ***M. fusca*** (p. 32)
T subdistally with small notch and clear distal point, no distal spine; P5-7 basis posterodistally only slightly widened; Cx1 anteriorly pointed; U1 surpassing end of peduncle U3 .... ***M. danae*** (p. 30)

5. Gn2 male, palm S-shaped curved and defined by tooth-shaped elevation, but no incision; telson spines both about half length of telsonic lobe..... ***M. bousfieldi*** n. sp. (p. 40)
Gn2 male, palm with incision ..... .6.

6. Telson, distal spine > half of T length; Cx1 anteriodistally rounded; Gn2 palmar corner harmoni cally rounded, no defining tooth ..... ***M. similis*** (p. 38)
T distal spine < half of T length; Cx1 anterodistally pointed; Gn2 palmar corner with defining tooth..... ***M. jerrica*** n.sp. (p. 40)

KEY TO ALL SPECIES OF *MAERA* SENSU STRICTO WORLD-WIDE

1. Gn2 dactylus outer margin with 4-5 setae, propodus hind margin shorter than palm: species may NOT belong to *Maera* sensu stricto ..... ***M. tinkerensis*** (8-9mm)
   Gn2 dactylus outer margin with many setae; propodus of hind margin slonger than palm ..... **2.**

2. Eyes absent. ..... **3.**
   Eyes present ..... **5.**

3. P5-7 basis linear and very elongate ..... ***M. tenera*** (10mm)
   P5-7 basis widened and rounded ..... **4.**

4. Gn2 palmar corner with about 90°; head antero-inferiorly produced into long and acute tooth ....
   ..... ***M. edwardsi*** (12.5mm)
   Gn2 palmar corner scarcely developed; head without tooth defining subantennal sinus .....
   ..... ***M. anoculata*** (6.5mm)

5. Telson lobes V-shaped incised, with spine sitting in incision. ..... **6.**
   T with 3 spines and more than one notch; Gn1 palmar corner with ... ***M. pachytelson*** (7-8mm)

6. P5-7 dactyli bifid; Gn2 male, basis bottle-shaped swollen..... ***M. similis*** clade (see key above)
   P5-7 dactyli simple ..... **7.**

7. U3 rami very elongate, > twice the length of peduncle..... ***M. danae*** clade (see key)
   U3 rami shorter than 2x peduncle length. ..... **8.**

8. P5-7, dactyl > half length of propod, basis proximally widened, distally very narrow, hind margin nearly straight, no posterodistal lobe ..... ***M. sodalis*** (11.5m)
   P5-7 dactyli ≤ half length of propodi ..... **9.**

9. Ep3 inferior margin serrated; P5-7 basis hind margin rounded, small postero-distal lobe present, eyes rounded ..... ***M. schieckei*** (6mm)
   Ep3 inferior margin smooth; P5-7 basis otherwise, lacking postero-distal lobe; eyes reniform .... **10.**

10. Gn2 male, palm with V-shaped incision..... ***M. hirondellei*** (9mm)
    Gn2 male, palm without incision ..... ***M. grossimana*** (9-10 mm)

11. Telson with 3 spines and more than one notch; Gn1 palmar corner square .....
    ..... ***M. pachytelson*** (7-8 mm)
    Telson with<3 spines, with one or no notch; Gn1 palmar coner obstuse or absent ..... **12.**

12. P5-7 basis linear and very elongate; Gn2 palmar corner ornate, with prominent spine; telson with notch or spine(s); eyes occasionally weakly pigmented ..... ***M. loveni*** (19 mm)
    P5-7 basis widened; Gn2 palmar corner without prominent spine; telson without notch or spines, eyes normally pigmented ..... ***M. fusca*** (14 mm)

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beset with many setae; never excavated on inner margin. P3-7 dactyli simple or bifid. U3 with long and slim or short rami, at least outer ramus distally truncate, not pointed (vs. lanceolate and pointed in *Othomaera*). Telson deeply cleft.

MAERA DANAE - CLADE

As species of this group have extremely small (but constant) morphological differences, we revised very carefully the collections at the USNM and CMNC, comparing North Atlantic with North Pacific material and studying the various descriptions.

We recognize a panarctic species, probably *Maera danae*and revalidate *Maera fusca* found partly in the north, but reaching further south and seemingly ecologically differentiated (from sponges or living on worms). *Maera loveni* was found also in the North Atlantic, Arctic, and North Pacific, and a quite similar new species is defined from California.

Diagnosis: Eyes oval to reniform. A1 acc.flag < 0.5 length of flagellum. Md palp art 1 distally obliquely lengthened, or pointed, art3 =0.6-0.75 length of art2. Gn2 propodus in both sexes not much widened, palm oblique, palmar corner well defined, about 120-150°. Gn2 dactylus with many setae on outer margin; P3-7 dactyli simple (vs. bifid in *Maera similis* - clade). U3 with long and narrow rami (vs. short and truncate in *Maera grossimana* , the type species), l:b >4, distal spines short. Telson lobes distally entire or notched, 0-1 robust spines distally.

Maera danae (Stimpson, 1853)

Leptothoe danae Stimpson, 1853: 46, pl. 3, fig. 32
Moera danae Bate 1862:190, pl. 34, fig.6
Maera danae Holmes 1905: 525, pl 12, fig. 2; Shoemaker, 1955: 53; Bousfield 1973: 222, pl.X, fig. 1.
?*Maera prionochira* spec. dubia Brüggen, 1907: 230, fig. 5-7; Gurjanova 1951: 758, fig. 527 (cites Brüggen); Stephensen 1935-42 :310-313, fig. 39 (cites Brüggen).

Taxonomic comments: Stimpson described his *Leptothoe danae* thoroughly, but gave only a sketchy illustration. His type came from Grand Manan, Bay of Fundy, (New Brunswick); about 23mm long , had a uniform bright flesh colour, small subreniform eyes, acc. flag = 1/3 flagellum; A2 art4=5, and his figure of P5-7 shows an elongate, scarcely broadened basis. While the type was taken from the *Laminaria* zone (patches of sandy bottom with numerous weedy rocks), the presumed young appeared in less deep regions in the Coralline zone.

Shortly after him, Bate (1862) transferred *Leptothoe* to the genus *Moera* and redescribed the (?same) animals, with another quite sketchy figure. The essential difference is the indication of the length, which Bate gives as 0.7 inches (about 18 mm).

Two years later, Bate (1864) treated N-Pacific material from Esquimalt Harbour, Vancouver Island, and recognized *Maera fusca* (from a sponge at 19m depth); he gave a very poor description, with no length and no figures. Stebbing (1888: 277, and 1906: 440) gave an overview of the literature.

Holmes (1904: 239) cited *M. dubia* from Popof Island, Alaska (under rocks on the shore), and he also agreed in differentiating [1905: 525, pl.12 (a photograph)] *Maera danae* from Eastport, Maine.

Shoemaker (1955) studied material from Point Barrow, Alaska, and gave a synopsis to the literature.

Bousfield (1973) gave a detailed figure of *Maera danae* (female 22mm) and summarized the distribution as North Atlantic Ocean, from the Gulf of St. Lawrence, Nova Scotia and Gulf of Maine to New Jersey.

It is impossible to decide with certainty whether or not *Maera danae* may be synonyous with ?*Maera prionochira* spec. dubia Brüggen, 1907, from Spitzbergen and Barents Sea. The very detailed description deals with a badly preserved and partly anomalous animal of 15mm. Gurjanova cites the same material and reprints the illustrations of Brüggen (1951: 758, fig. 527) as does Stephensen (1935, 42 :310-313, fig. 39) who could not check the so-called Gn2 female on type-material. Brüggen's text tells about flagella with 17-27 articles and a richer material from the collections of the Zool. Inst. Acad. USSR from the Kara-, Chukchi and Bering Seas. Gurjanova (1951, p. 759) reports *M. prionochira* from 6 m depth in the Barents Sea, South Spitzbergen, and Brüggen (1907) and Stephensen (1935- 42: 313) from 9 m.

The Smithsonian collection contains Atlantic material of *Maera danae* (Stimpson, 1853) from the type region and at a depth 50-74 m from Massachusetts (1 female ov. 13mm USNM 135096, 1 male 12mm, USNM 135095) and New Jersey (ca 15 juv.). Although Shoemaker (1955) reports on 18mm specimens from the Atlantic that were deposited in the Smithsonian collection, we could not find them. The specimens from Massachusetts are much smaller than described for the type or by Bousfield (1973); otherwise there are no essential differences and the Massachusetts material matches perfectly with that from Point Barrow or from the Arctic Bay in the North Pacific. Bryazgin (1997: 99) reports *Maera prionochira* from SE Barents sea, 2-50m, without further details.

Maera cf. *danae*

(Fig. 2)

Material examined:

GULF OF ALASKA:

CMNC 1999-0019, Montague Island, MacLeod Harbor (59°53'N, 147°46'W), Gulf of Alaska, Pacific Ocean; eelgrass, gravel, coll. E.L. Bousfield Stn. 1961-123, 13 July 1961 - 1 male 12mm, partly in alcohol, partly mounted as slide.

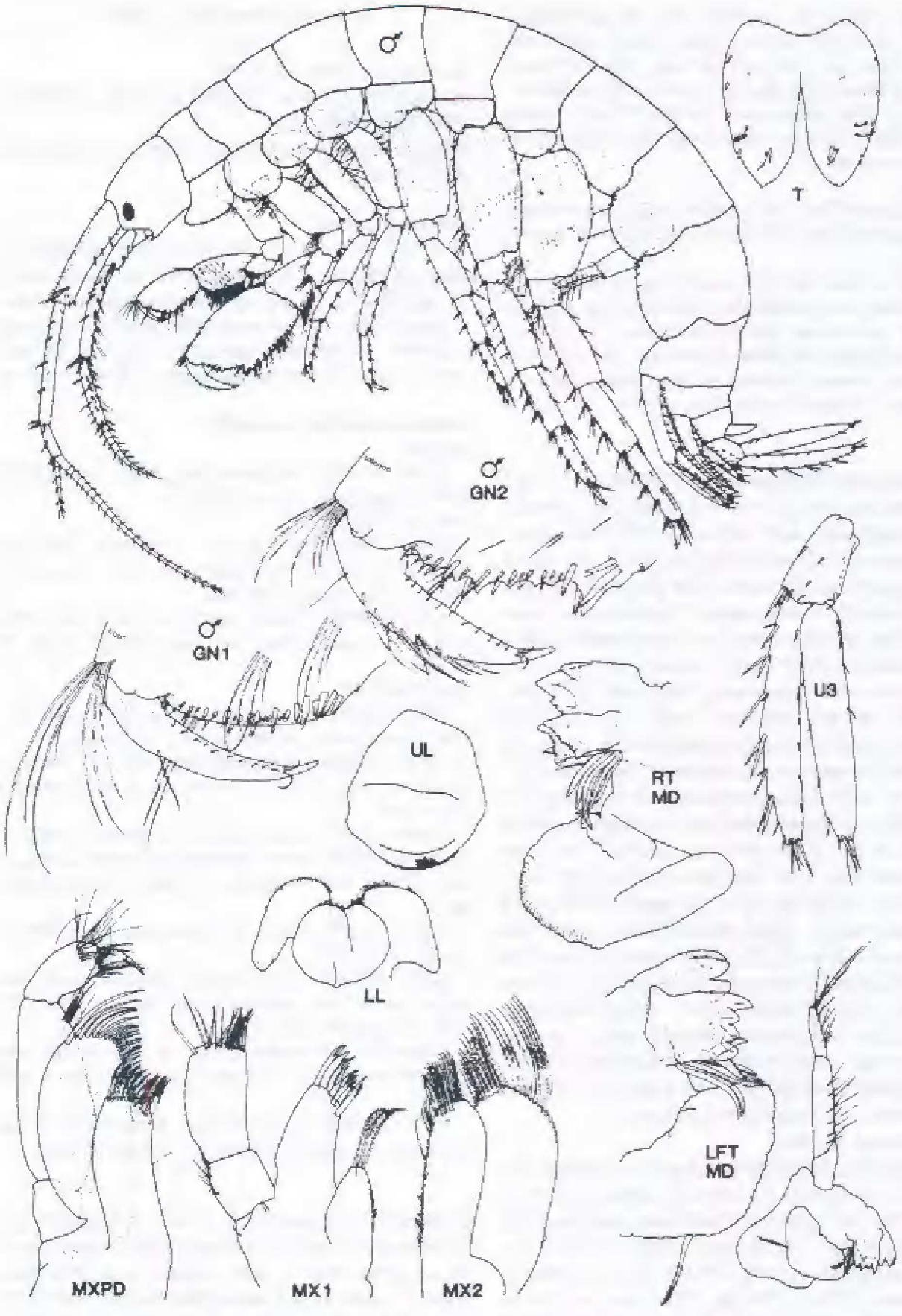

Fig. 3. *Maera fusca* (Bate) Male 14mm, Vancouver Island, B.C.

CMNC 1999-0020, Controller Bay, Kayak Entrance (59°59'N, 144°22'W) kelp, boulders, muddy gravel coll. E.L. Bousfield Stn. 1961-123, 27 June, 1961 - 1 fe-male 14,5mm, habitus + one side legs in alcohol, rest mounted.

USNM 291386, Saldovia Bay, Cooks Inlet, Gulf of Alaska, July 22 1899, W. E. Ritter, Dept. Zool., Univ. Caliornia - ca. 30 spec. 8-10mm.

ARCTIC:

USNM 291387, off Point Barrow, 110 m, gravel, stones, Arctic Research Lab., MacGinitie coll., 9/1/1949 - 4 spec., 12-14 mm.

USNM 291388, off Point Barrow base, 4 miles out,ca gravel (small), 58m, MacGinitie coll., Arctic Res. Lab., 10/14/1949 - 1 male 16mm, 1 juv. female 14mm, 4 spec. 10mm.

USNM 291389, off Point Barrow base, 3.2 miles out, mud, gravel, stones, few small rocks, ca 54m, MacGinitie coll., Arctic Research Laboratory, 2/18/50 - 4 spec. 8-12mm.

Diagnosis (after Pacific material): female ov. 14-14.5 mm. Body smooth; eyes oval, Md palp art 1 distally acutely lengthened, art3: art2= 0.7; Md molar large.; Cx1 anterodistal corner acutely produced; Gn1 dactyl outer margin with many setae; Gn2 not much different sexually, dactyl on outer margin with many setae; palm well defined by prominent tooth, not preceded by a special incision; P5-7 dactyls simple, but with additional spine on the inner margin (Bousfield 1973 indicated P5-7 dactyls "bidentate at tip", which could be mistaken for the bifid dactylus shape of *Quadrimaera;* he probably meant the short spine sitting posterodistally of the nail); basis posteriorly not lengthened to lobe,hindmarginimmediatelywideningatposterodistal end with corner of 90-120° (less calcified than main part of basis, therefore often less easily seen); P7 basis ratio width : length about 1:2; propodus P7 with 0-2 spines posteriorly. Ep2,3 distoposterior corner with upwards curved tooth; U1,2 both ending at about the same level, usually surpassing peduncle U3; U3 rami subequal, > 2 length of peduncle, > 4 times as long as wide, distally and laterally densely spinose (spines about as long as rami width). Telson pointed distally, on distointerior end of each lobe a more or less deep indentation, with single spines and setae.

Distribution: Alaska.

Remarks: The rami of uropod 3 seem to be somewhat unequal in subadults, but normally subequal in fully adults. The distal spine on telsonic lobes [see Bousfield (1973: pl. X fig.1), or Brüggen (1907: fig. 5-7), repeated in Gurjanova (1951: 759 fig. 527), as well as in Stephensen (1935-42: 312, fig. 39)] can be lost, but the incision, interior and distal to the tip, is always clearly visible.

Maera fusca (Bate, 1864)

(Fig. 3)

Moera fusca Bate, 1864: 667

Maera dubia Calman, 1898:269, pl. 32, fig. 3.; Holmes 1904: 239; 1908: 539.

Typelocality: Esquimalt Harbour, Vancouver Island (North Pacific Ocean).

Material Examined:

CMNC 1999-0016, Vancouver Island, British Columbia, Josephine F. L. Carl coll., 19 July, 1955 - 1 male 14 mm (**Neotype**), in alcohol, partly mounted on slide .

CMNC 1999-0017, Gonzales Point, Victoria, Vancouver I. (48°25'N, 123°18'W), Josephine F.L. Carl coll., 14 April, 1941 - 1 female 13 mm (**Neoparatype**), in alcohol, slide mt.

Additional material examined:

ARCTIC:

USNM 291390, Point Barrow Base, washed ashore, 8-32-35/49 - 1 specimen, 17 mm (# 318a).

BRITISH COLUMBIA:

CMNC 1999-0016; Bazan Bay, N. Saanich, Vancouver I., (48°58'N, 123°24'W), Josephine F.L. Carl coll., 19 July, 1955 - 1 male 12mm, slide mount.

USNM 291391, Masset, Queen Charlotte Ids., 27-28 June, 1946 - 1male 17mm, 1 iuv. female 16mm, 3 spec. 14-12 mm.

WASHINGTON:

USNM 291392 , 6 specimens, 10-11mm, Brown I., 8-3-1940 ?, under rocks, commensal with tube worms.

USNM 291393 3 specimens 9mm; 1specimen 8mm; 2 specimens 6mm., Brown I., San Juan Ids., coll. R. Fernald.4 Aug., 1948,

USNM 291394, Friday Harbor - 1 specimen 10mm.

USNM 291395, Culvers Point, Friday Harbor, L. Holthuis coll., 22 July, 1952 - 1 female ov. 13mm; 1 specimen 12.5 mm.

USNM 291396, Pacific Biol. Lab., 24/11, 101/365 - 1 specimen (broken).

USNM 291397, "Minnesota reef", San Juan Islands, bedded on muddy sand underside rocks, about midtide, 16/7/1950 - 8 specimens 6-9mm.

USNM 291398, Old man's farm, San Juan Islands, high intertidal, under rocks, Peternick coll., 30/7/1950 - 1 male 15mm.

USNM 291399, Minnesota Reef, San Juan Ids., under stones among weeds, 28/7/1950 - 2 males 15mm, 6 juv.

Diagnosis: Very close to *M. danae* , distinguished by: habitus robust, body more strongly calcified and green-brown colour that is often retained even in alcohol (specific name means dark; Bate noticed the brown colour also in his original description); Md palp art 1 distally obliquely lengthened, art 3 about half of art 2.

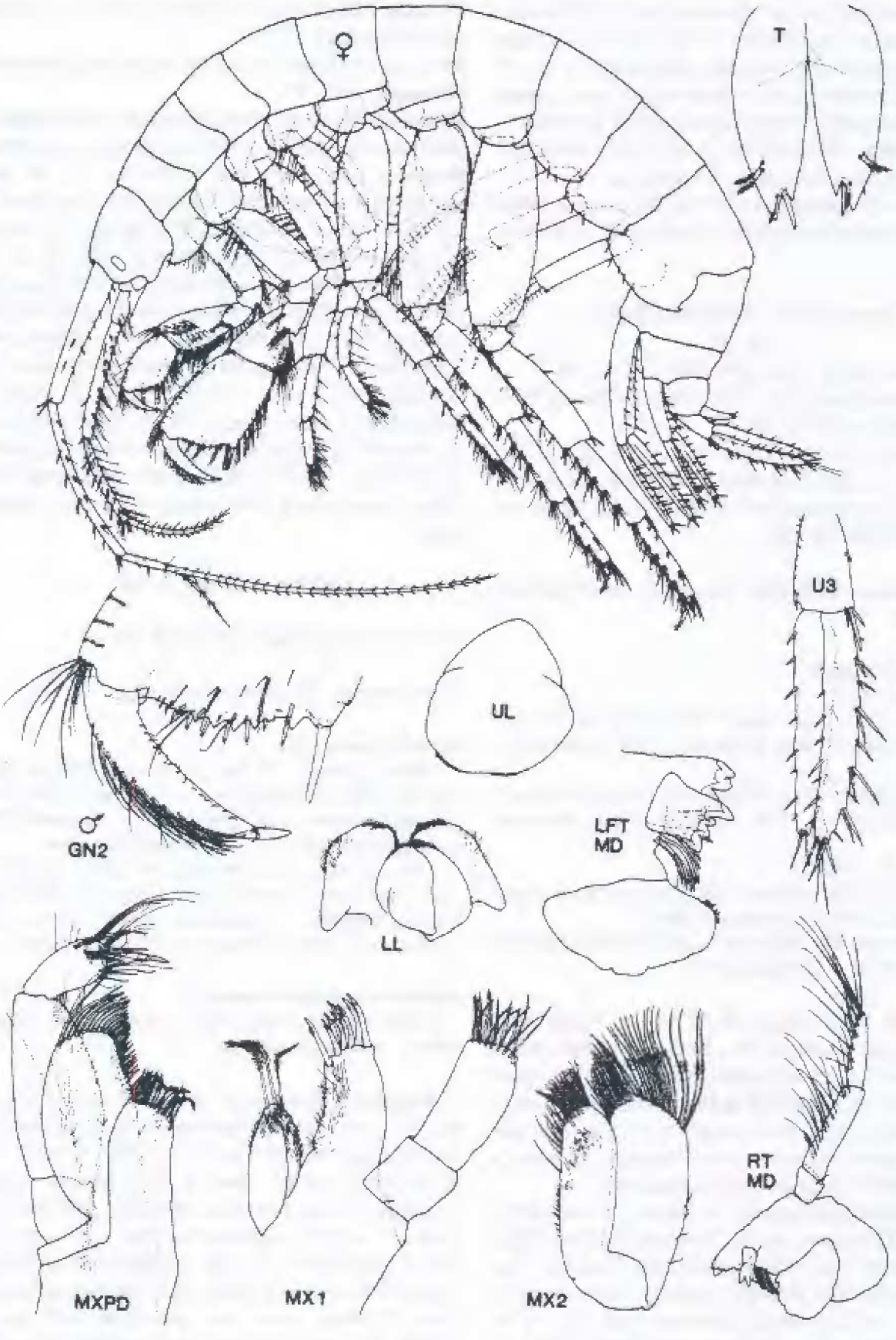

Fig. 4. ***Maera loveni*** (Bruzelius). Female 19mm, Alaska

Cx1 anterodistal corner less acute; Gn2 in both sexes broader, palm less oblique; P5-7 basis hind margin distally immediately widened, distoposterior corner strongly developed; U3 rami relatively narrower; telson lobes distally entire, distal point scarcely developed.
Distribution: North Pacific from Point Barrow (1 specimen washed ashore) to Washington.
Ecology: with sponges or tube-building worms, under rocks from intertidal to among seaweeds at 10 fathoms, ca 18m.

Maera loveni (Bruzelius, 1859)
(Fig. 4)

Gammarus loveni Bruzelius, 1859: 59, t.2, fig. 9
Moera loveni Bate 1862: 193 t. 35 fig. 1; Oldevig 1917: 36; Stephensen 1913: 194
Maera loveni Norman 1868: 416 t. 21, fig. 11, 12; Sars 1895: 519, t. 182 f.2; Stebbing 1906: 438; Shoemaker 1930: 116; Stephensen 1927: 114; 1940: 311; Gurjanova 1951: 757-758, fig. 526.

Type locality: Bohuslän (Skagerrak, North Atlantic) 73-110m.

Material examined:
WASHINGTON:
CMNC 1999-0022: Lopez I., R.I. Smith coll., 23 Aug., 1955 - 1 female 19mm, in alcohol, partly mounted on 2 slides.
USNM 291400, Puget Sound, soft, fine mud + algae, J. L. Mohr coll., 18 Aug. 1948 - 1 specimen 23mm, 1 specimen 18mm.
NORTH ATLANTIC:
USNM 291401, Albatross Sta. 2506, off Nova Scotia, Gulf of St. Lawrence, 1 specimen 28mm.
USNM 291402, Prince Edward Island (Gulf St.Lawrence), 23 Nov., 1925 - 1 specimen 28mm.

Diagnosis: Body length 18-35 mm. Md palp art 1 obliquely produced, art 3 = 0.75 art 2. Gn2 palmar margin with teeth and spines, with one strong spine directly sitting upon Gn2 palmar corner (diagnostic); P5-7 basis narrow, hind margin not rounded; telson distally excavated, inner corner shorter than outer, a robust distal spine sitting in the excavation.
Distribution: Kristiansund, N. Norway (Boeck 1871); Tromsø (Stephensen 1940); Greenland (Hansen 1888), Spitzbergen (Goes 1866); Koster Island, Gullmar Fjord in Skagerrak, West Sweden (Bruzelius 1859), Kattegat (Meinert 1877), Scotland (Norman 1866); Gulf of St. Lawrence, Nova Scotia (Shoemaker 1930); SE Barents sea (Bryazgin 1997).
Ecology: Depth from 20-300 m., on clay, sand and shells (Bryazgin 1997).
Biology: Ovigerous females in August and September (Bryazgin 1997: 99).
Remarks: There are three characters, most helpful to determine this species, which are repeated in literature: Bruzelius (1859) described in his text (p. 59, third paragraph from below) and figured the typical spine on top of the palmar defining tooth in Gn2 (t.2, fig.9a and 9l), repeated then in Sars (1895: pl. 182, fig. 2), cf. figure 4 here; the other is the extremely elongate shape of P5-7 basis in female (see habitus drawing in Bruzelius and Sars, loc. cit., fig. 4 here) and the telsonic lobes with inner edge of incision clearly shorter than outer one (Bruzelius t.2, fig. 9n; Sars pl. 182 fig. 2t, cf. fig. 4 here). *Maera tenera* Sars, 1895 is incompletely described and figured with a habitus which is very similar to *M. loveni* , but P5-7 basis is still more linear. This 10mm species from 763m depth was never reported again.

Maera nelsonae n. sp.

Maera loveni Barnard 1962: 103, fig. 19.

Type locality: Monterey, California.

Material examined:
USNM 291403, US Fish commission, Steamer Albatross, Sta. 4523, Monterey Bay, CA, 75-108 m, 26 May, 1904 - female ov. 14 mm , in alcohol (**Holotype**). Barnard (1969a: 6) defines the locality as a "cold-temperate region".
Mugu Canyon, Sta. 4851 (32) (34°03'N, 119°06'W), 192m, bottom of fine green sand, 7 February, 1957- male 15mm (**Paratype**). Deposited at Scripps Inst., La Jolla (published and figured in Barnard 1962:103, fig. 19).

Additional material examined:
USNM 291404 Bering Sea, 1 male 37mm, 1 female 35mm, 1 damaged specimen.

Diagnosis: Species very close to *M. loveni* , *M. fusca* and *M. danae*, distinguished mainly by: Eyes reniform, but indistinct (like *M. loveni*, vs. well developed, oval in *M. fusca* and *M. danae*); A1,2, peduncles thin, flagellum A1 = peduncle (vs. shorter in *M. fusca*); Md palp art 1 distally lengthened to tooth, art 3: art2 = 0.8, Gn1,2 propodus with well developed palmar corner, propodus widening distad (vs. not widened in *M. danae, fusca*), palmar corner with prominent tooth like *M. loveni* , but without strong spine directly on palmar corner (spine diagnostic for *M. loveni*), but spines

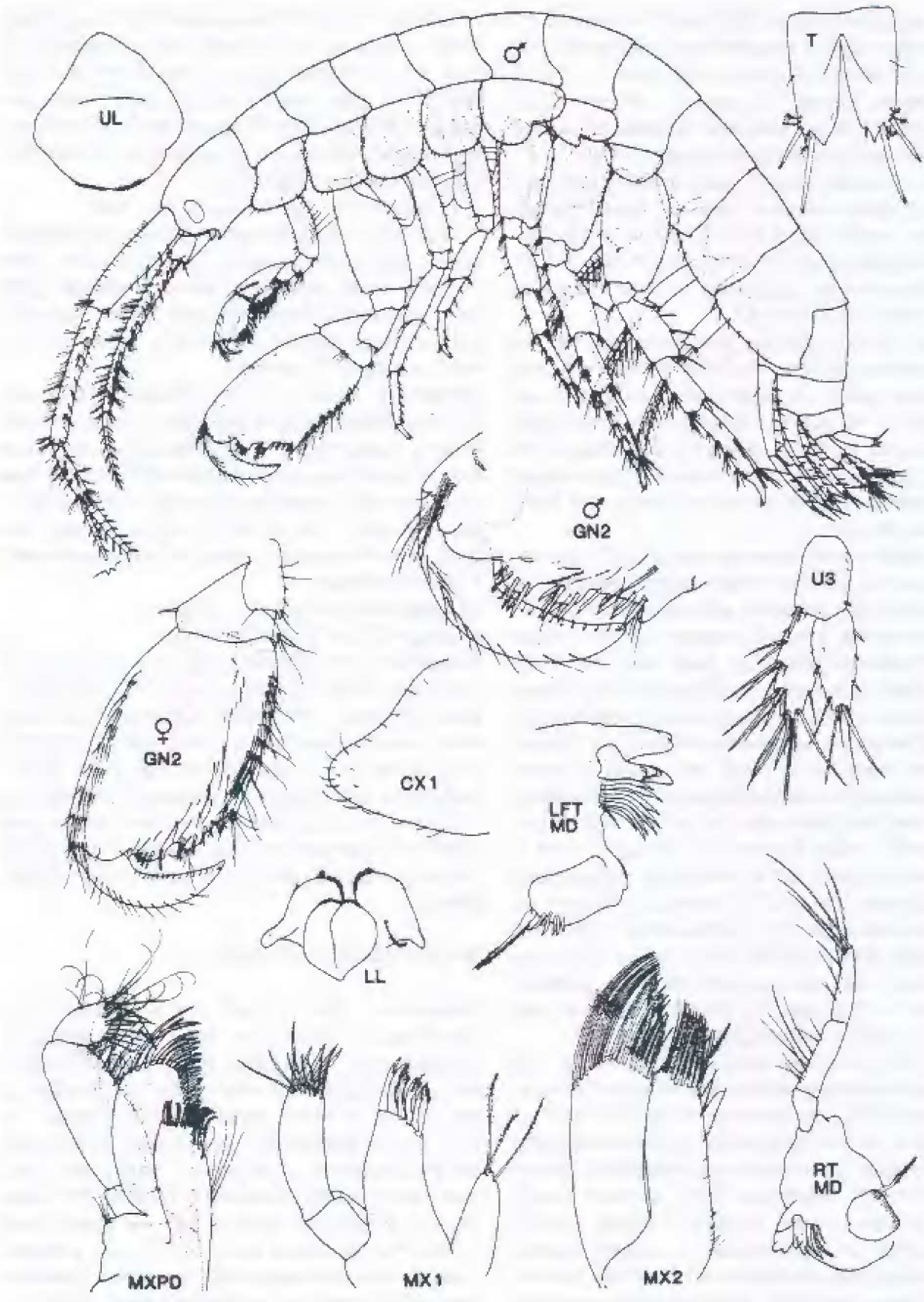

Fig. 5. ***Maera similis*** Stout. Female 6.5mm, Cape Beale V.I., B.C.

before and after tooth-tip. P5-7 basis l:b = about 2, P7 hind margin widened, rounded; telson with small notch distally (vs. entire in *M. fusca* or incised in *M. loveni*).
Description: Female 15 mm, ov. 14 mm. Ep2-3 posteroventral corner produced to upwardly curved tooth (not visible in Barnard's figure of male).

A1 = > 1/2 body length, peduncle art 1< art2, art 1 with 4-5 spines and many setae on ventral margin, flagellum = peduncle, with 25-27 arts, acc. flagellum 1/4 of flagellum length, with up to 8 arts. A2 > 1/2 A1, peduncle art 4> art 5, gland cone 2/3 of art3, flagellum setose, with up to 10 articles.

Upper lip and epistome like those described for "*Linguimaera othonides*" by Pirlot (1934)(*Maera* sensu lato *othonides*), i.e. much more protruding than in *M. loveni* . Md palp art 1 distointerior corner lengthened to acute tooth (vs. obliquely lengthened in *M. loveni*), arts 3: art2=0.8, art. 2 with ca 7 long setae and many shorter ones, art . 3 with shorter medial setae, long ones distally.

Cx1 antero-ventral corner produced. Gn1 basis with long setae on posterior margin; carpus without any incision dorsally; propodus palm delimited by a distinct blunt corner, no special prominent spine on palmar corner; propodus rather large, palm obliquely curved; carpus clearly > propodus, dactylus with many setae on outer margin. Gn2 basis anterior margin with 4 groups of long setae, (in hyperadults only a distal group), posterior margin with many long setae; propodus broadly subtrapezoidal, palmar margin S-curved (diagnostic!) and beset with many short spines, with excavation distally; palm delimited by a triangular tooth in both sexes, on inner side of tooth a short, robust spine on half(hyperadult) or 2/3 (female ov.) distance between excavation and tip of tooth; on outer margin, next to tip of this defining tooth, a pair of strong spines, one inserted on inner, one on outer side of the propodus (identical in types and hyperadults); dactylus inner margin smooth, outer margin with many setae.

P3-7 dactylus simple, nail building a "pincette" with a curved spine sitting on distal inner margin of dactylus (like in all *Maera* species sensu stricto). P3-4 similar in shape, weak. P5-7 basis narrowly ovato-rectangular, l:b >2 in male =2, in female and hyperadults, without postero-distally lengthened lobe, posterior margin nearly straight in male, rounded in female, postero-distal corner in male angular, in female rounded, P6, 7, basis similar in shape to P5, but wider, postero-distal corner of merus P5-7 with very short setae; P6,7 propodus posterior margin without setae.

U3 rami l:b >5, distally truncated, with many spines about as long as, or somewhat longer than,width of rami, no art 2 of outer ramus. Telson somewhat longer than broad, lobes distally scarcely incised on outer margin next to distal tip (U-shaped small excavation in hyperadults), with a short spine sitting in the incision, distolaterally some short setae.

Female with 6 eggs, oostegites very slim.

In the hyperadult specimens A1 does not surpass half of body length, Gn2 propodus dactylus matches palm perfectly, distal incision on telson is deeper, inner corner of telsonic incision not much shorter than outer one (vs. clearly shorter in *M. loveni*). U3 rami are 1.5 times as long as P7 propodi.
Etymology: Dedicated with gratitude to Elizabeth Harrison-Nelson, faithful and highly valued assistant of Jerry Barnard,and is the only remaining staff member now in the Crustacea Department of the Smithsonian concerned with amphipods. Already in Jerry's time - and still now - she is always willing to help, and thinking how to make people happy by solving so many visitor`s problems.
Distribution: Bering Sea, California.
Ecology: 137-ca 200m (California).
Remarks: In this difficult group of morphologically extremely similar animals, ecology is a useful additional character. The present specimens from deep waters surely cannot belong to the intertidal, robust *M. fusca*, to which it is most similar. The shape of P5-7 basis in the male, figured by Barnard (1962: 103, fig. 19), shows a much more angular hind margin than found in the present animals. Otherwise they match perfectly, especially the female, found in a very similar locality.

MAERA SIMILIS - CLADE

Diagnosis: Body smooth. Eyes reniform (vs. *Quadrimaera*). A1 accessory flagellum < 0.5 length of flagellum (vs. > 0.5 in *Quadrimaera*). Scarcly lengthened Md palp art1, art 3 ≤ art 2 (less reduced than in *Maera* sensu stricto, about 0.85-0.9, or equal; vs. art3>art2 in *Quadrimaera*); many setae on outer margin Gn2 dactyls (vs. *Quadrimaera* with 1 seta); Gn2 male basis medially bottle-shaped swollen; P5-7 dactyli always bifid (like *Quadrimaera* , vs. *Maera danae* - clade having simple dactyls). U3 rami subequal, truncate, distal spines distinctly longer than breadth of rami, which length never exceeds 3 times width (vs. *Maera danae* - clade). Telson distally deeply incised,

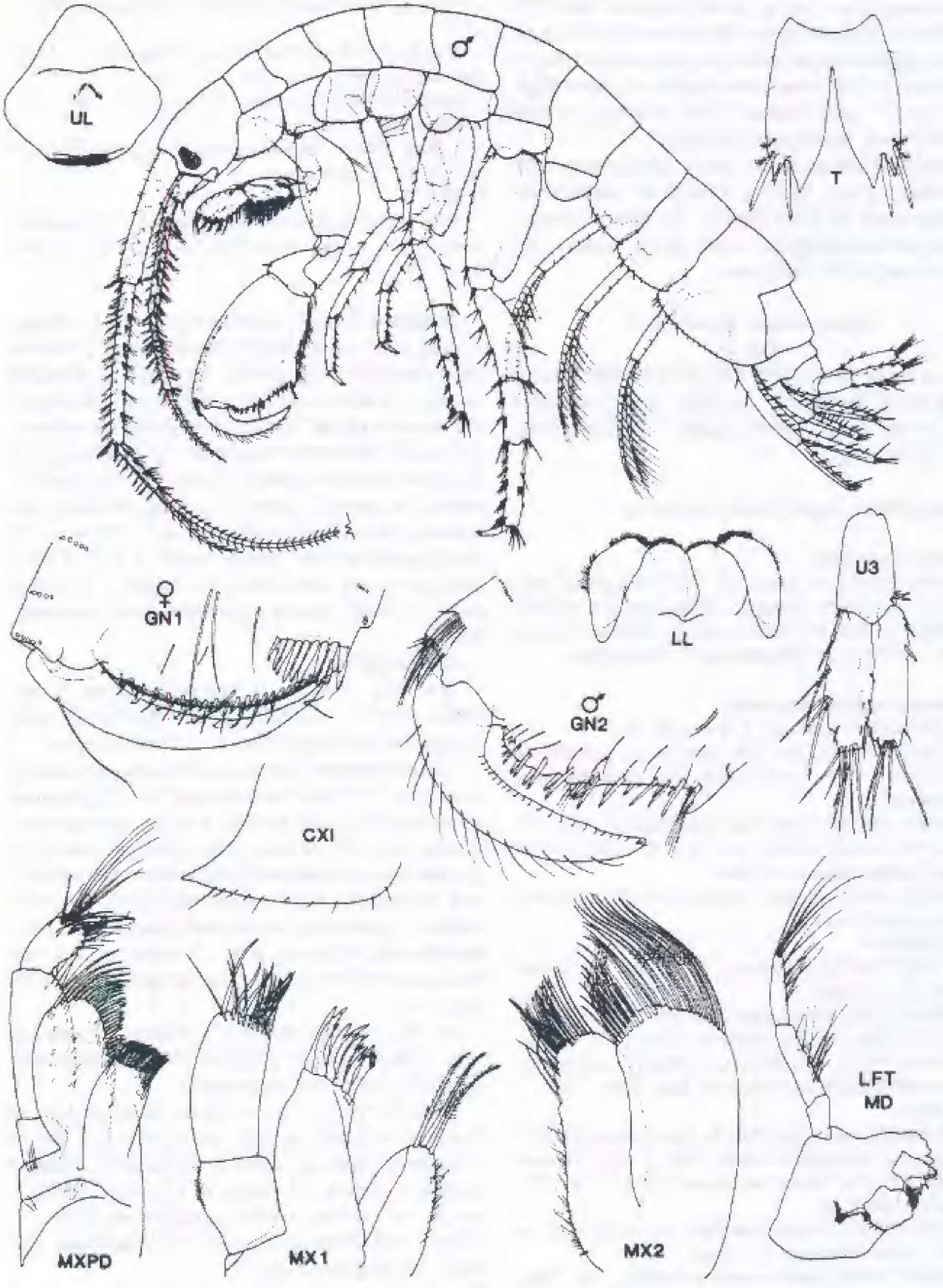

Fig. 6. ***Maera bousfieldi*** n. sp. Male 11.5mm, Clover Pt., B.C.

one strong spine sitting in this incision (0.3-0.5% length of telson), 1-2 spines of similar or shorter length sitting outside the excavation on outer margin, next to insertion of 1-2 plumose setae (vs*Maera -danae* clade with only 1 spine sitting in the incision, or most *Quadrimaera* having many spines).

Remarks: While the *Maera danae* - clade appears to be an Atlantic group, reaching through the Arctic to the northern parts of North Pacific, the *Maera similis* - clade continues along the north Pacific Coast to the warmer regions of California.

Maera similis Stout, 1913

(Fig. 5)

M aera simile Stout, 1913: 644, 645; Barnard & Reish 1959: 48-49 (partim), pl. 4, Figs. A-P ("abnormal male") and N,O ("normal female"); Barnard1969a: 122,123 (partim).

Type locality: Laguna Beach, California

Material Examined:

USNM 291405, Monterey Bay, Pac. Biol. Lab., 22 Mar., 1930 - 1 female 6mm (**Neotype**), Scripps Inst. acc. 152/768.

USNM 291406, off Punta Loma, W. Schmitt, 21 Aug., 1918 - 1 female 5mm (**Neoparatype**), Scripps Inst.

Additional material examined:

BRITISH COLUMBIA (E. L. Bousfield coll.):

CMNC 1999-0012 Sta.710b, Cape Beale V.I. (48°47'N, 125°13'W), cove, HW sand, 19 July 1970 - female 6.5mm, slide mount.

CMNC 1999-0012, Sta.710b, Cape Beale V.I. 48°47'N, 125°13'W, cove, HW sand, 19 July, 1970 - male 6mm, in alcohol, partly mounted on slide.

CMNC 1999-0012, ibid. - female ov. 6mm, in alcohol, partly mounted on slide.

CALIFORNIA:

USNM 291407, Santa Monica, Clark coll. - + 25 males, female, juv. 4-9mm.

USNM127583,SantaRosalsland,(VelerolV),34°01'05", 120°16'W, 35m, coll. J.L. Barnard, 20 Dec.1956 - 3 spec.

USNM 291408, Pac. Biol. Lab. 100865 Monterey Bay, from rocks brought up from more than 180m, 1928 - 2 specimens.

USNM 291409, Corona del Mar, Hancock sample 46-6-6, *Laminaria* holdfasts, 9-11 Dec., 1962 - 1 male, 1 female.

USNM 291410, Venice, breakwater, 25 Oct. ,1912 - 2 females 6.5 mm, 5 juv.

USNM 291411, Venice, from Bryozoan colonies, 29. 10. 1913 - 1 male, 2 females ov. , 2 juv.

USNM 291412, Cable Crossing Structure, San Diego Harbor, coll. T. Bowman, 30 Dec., 1948 - 1 female ov. 7 mm, 1 female 8mm.

USNM 291413, locality?, 152/768 - 6 females 6mm, +20 juv.?

USNM 291404, Corona del Mar, McGinitie coll., 15 July, 1931 - 2 females 6mm, 7 juv.

USNM 291415, Presidential Cruise, 1938, 3-38 - 2 females 6mm.

USNM 291416, Venice, Isthmus, Acc. 236-T43-12, 19 Aug.,1913 - 1 female 6mm.

MEXICO:

USNM 142573, Sinaloa, Topolobampo, 1 mile seawards, tunicates and sponges, on rocks at 1 m - 1 male , 1 female ov., 2 juv.

Diagnosis: Length 6-8mm; peduncle art1 subequal to art2; Cx 1 anterodistally rounded; Gn2 propodus subrectangular, with parallel anterior and posterior margins, in both sexes palm oblique, in male,with 2 subquadrate humps and 2 subquadrate excavations, defined by shorter defining tooth; in Gn2 female the proximal excavation can be similar to male in hyperadults, but normally small or lacking, the distal one wanting, the defining tooth scarcely prominent. U3 rami spines nearly as long as length of rami. T elson with one strong spine (about 2/3 length of T) and 1(rarely 2) shorter ones on disto-exterior margin of each lobe.

Redescription:

Acc. flag. 10 arts., ca half of flagellum length; peduncle art1 = art2; Md palp art1 distally obliquely lengthened; art 3< art2, both arts. densely setose.

Cx 1 anterodistally rounded; Gn1 carpus not notched anteriorly; Gn2(Male) basis swollen, l:b=ca2, propodus subrectangular, with parallel anterior and posterior margins, Gn2 in both sexes palm oblique, in male with 2 subquadrate humps and 2 subquadrate excavations, well defined by prominent defining tooth; in Gn2 female ov. hyperadults, the proximal excavation is present, but smaller than in male , the distal one less visible, usually wanting; Gn2, outer margin of dactyl with many setae.

P3-7 dactyls bifid, basis P5-7 with short posterodistal lobe, subrectangularly widened, l:b = 2; dactyls slender, about half of propodus length.

U3 rami distally truncate, spines nearly as long as length of rami; art2 on outer ramus present. T deeply cleft, distally incised, with one strong spine sitting in excavation (about 2/3 length of T) and 1(rarely 2) shorter ones on distoexterior margin of each lobe.

Colour: dull, bluish green with violet antennae. Females carrying green eggs.

Distribution: British Columbia to Mexico.

Ecology: kelp holdfast from deep water (Stout 1913);

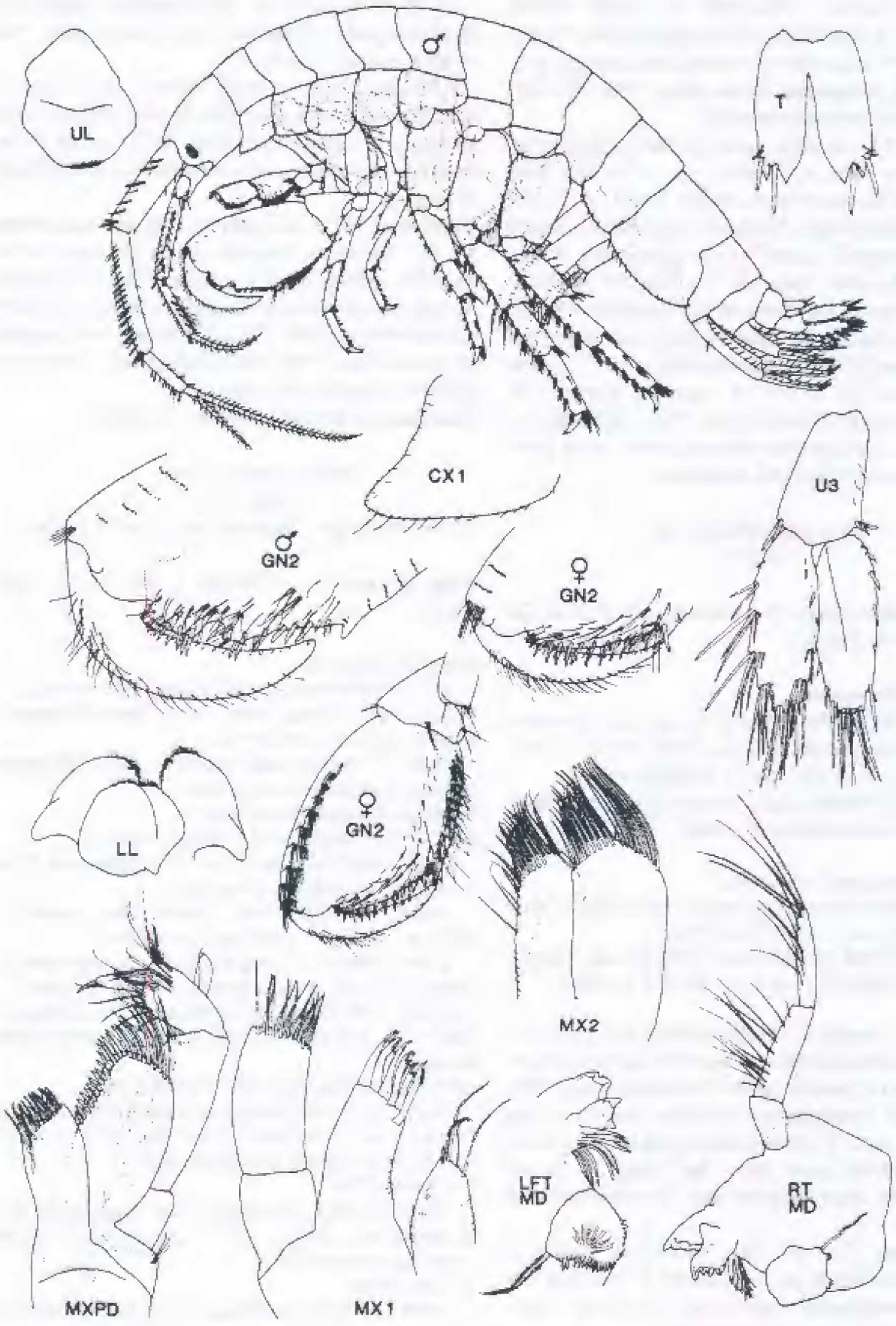

Fig. 7. ***Maera jerrica*** n. sp. Male 12mm, Little Daykoo I., SE Alaska.

bryozoan colonies (Barnard & Reish 1959), *Macrocystis*,*Laminaria* and *Egregia* holdfasts,*Phyllospadix* grid,*Phragmatopoma*,ontunicatesandsponges, loose rocks, calcareous worm tubes, 3-8m (Barnard 1969a). Sand (present material).

Remarks: The specific name for the English word "similar" in Latin is "similis, -is, -e" in the three genders; as the genus name *Maera* Leach 1813/14 is always used as female, the adjective should be changed from the original "simile" to the appropriate female ending. Barnard remarked (in Barnard & Reish 1959:24), that he found two main differences between the material found in Oregon (see *Maera jerrica* n. sp.) and that from California: the anterior corner of Cx1 and the presence (*M. similis*) or apparent absence (*M. jerrica*) of art2 in U3 outer ramus. "These features may be of use as a subspecific designation but more probably reflect environmental responses...."

Maera bousfieldi n. sp.
(Fig. 6)

Type locality: Clover Pt., Vancouver I., British Columbia, North Pacific.

Material Examined:

CMNC 1999-0021, Clover Pt., British Columbia, G.W. O'Connell coll., 25 Aug., 1976 - male 11.5mm (**Holotype**), in alcohol, partly mounted on slide.

CMNC1999-0021,Ibid.-female 9.2mm(**Paratype**), in alcohol, partly mounted on slide.

Additional material examined:

USNM 291417 (no locality data?) - 1 male 12mm, 1 male 10mm, 1 juv., Acc. 101/365, no. 24/10.

USNM 291418, Pac. Biol. Lab. -196m (no other data?) - 2 males, 3 females 9-10 mm acc. 101/368, No 28/4.

Diagnosis: Length 9-12mm; peduncle art1 < art2; Cx 1 acutely produced anterodistally. Gn2 margins widening distally, not parallel; palm oblique (corner ca 120°), in male and female smooth, without excavation, but defined by tooth. U3 rami spines > half length of rami. T with 1 strong spine (about half length of T) and another on the outer margin of each lobe (length similar or longer).

Description: A1 acc. flag. about half length of flagellum; peduncle art 1 shorter art 2. Md palp art1 obliquely lengthened distally, art 3 < art2. Cx 1 produced to acute corner anterodistally.

Gn2 palm oblique (corner ca 120°), in male and female smooth until prominent defining tooth.

P3-7 dactyls bifid, ca 1/2 propodus length; P5-7 basis with postero-distal lobe developed, about as wide as deep, basis l:b much > 2.

U3 rami truncate distally, spines > half length of rami. T deeply cleft, each lobe distally incised, with 1 strong spine sitting there (about half length of T) and another on the outer margin of each lobe (similar length or longer).

Etymology: With this epithet we express our gratitude for the chance to complete the description of this material, collected partly personally by Ed Bousfield during extensive marine biological surveys of the Pacific northwest, 1955-1980, and already well prepared when he retired temporarily from science. Thank you, Ed for having joined us again!

Distribution: British Columbia, N-Pacific.

Maera jerrica n. sp.
(Figs. 7, 8)

Maera inaequipes Barnard, 1954: 16-18, pl. 16,17.

Type locality: Little Daykoo I., SE Alaska, North Pacific.

Material examined:

CMNC 1999-0014, Little Daykoo I., SE Alaska, E. L. Bousfield coll., 31 May, 1961 - male 12mm (**Holotype**), in alcohol, partly mounted on slide.

CMNC 1999-0014, Ibid. - female ov. 10mm (**Paratype**), in alcohol, partly mounted on slide.

Additional material examined:

BRITISH COLUMBIA (E. L. Bousfield coll.):

CMNC 1999-0013, Hinks I., 10 July, 1964 - male 10mm, in alcohol, partly mounted on slide.

CMNC 1999-0027, Ibid. - male 7.5mm, female ov. 10.5mm, in alcohol, partly mounted on slide.

CMNC 1999-0015, Long Beach, Vancouver Island - female ov. 7.5 mm, in alcohol, partly mounted on slide.

CMNC 1999-0026, Trevor Channel, David Island, 21 July, 1970 - female ov. 9.5 mm, in alcohol, partly mounted on slide.

NORTHEASTERN PACIFIC REGIONAL:

CMNC 1999-0018, Skidegate Channel, Queen Charlotte Islands, B. C., C. M. Fraser coll.,17 Jun. 1935 - 1 male 12 mm, in alcohol, partly mounted on slide.

WASHINGTON:

CMNC 1999-0025, Mukkaw Bay, Washington, E. L. Bousfield coll., 31 July, 1966 - male12 mm, in alcohol, partly mounted on slide.

CALIFORNIA:

USNM 291419, Santa Monica, Clark coll. - 5 males 9-12 mm, 1 female ov. 12 mm, 2 males , 1 female 10mm.

USNM 291420, locality?, acc. Nr. 154967 - 1 male 9 mm, 1 female ov. 12mm.

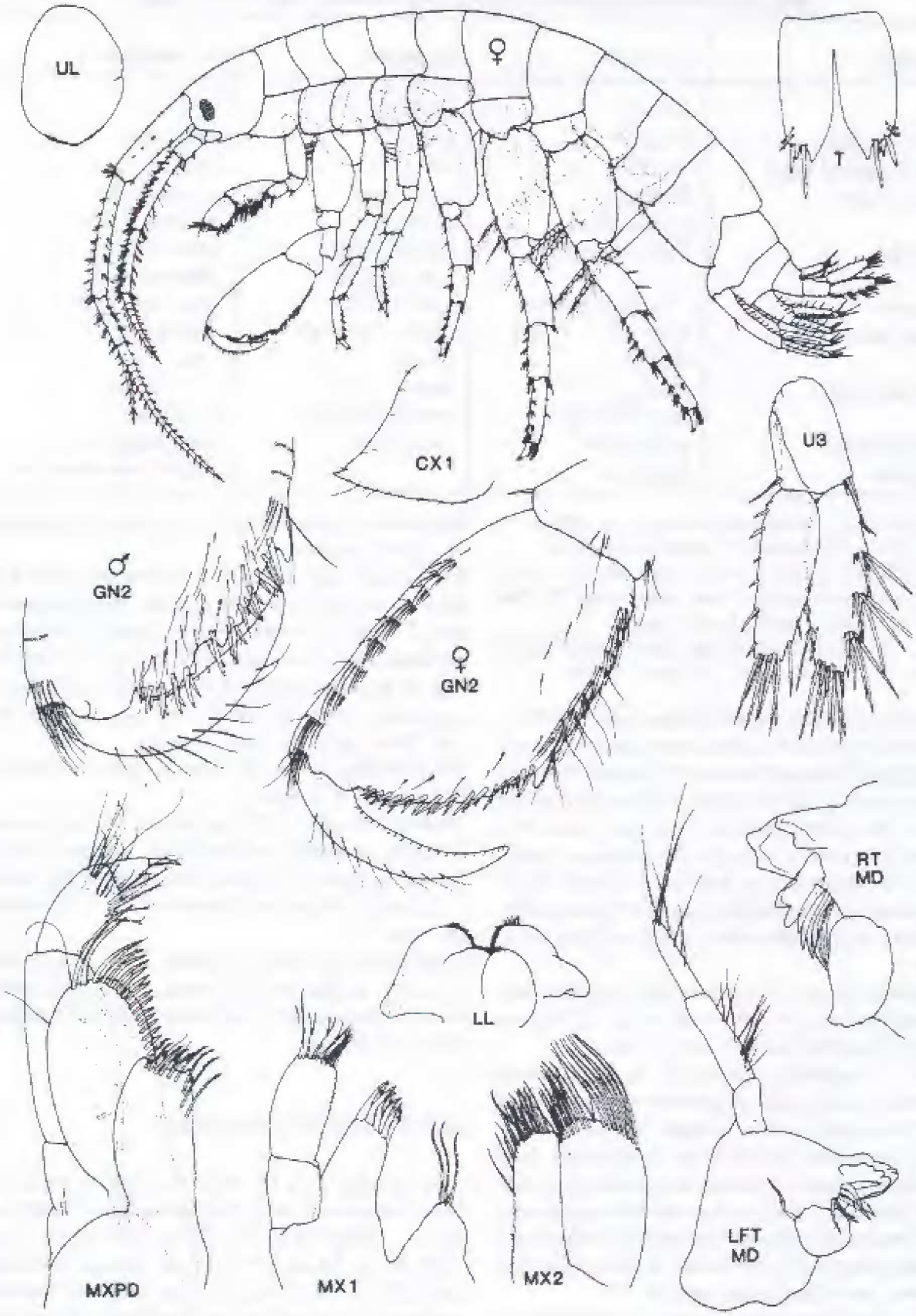

Fig. 8. ***Maera*** **cf.** ***jerrica*** n. sp. Male 8-9mm, Hinks I., B.C.

Comparison of three species of *Maera* sensu stricto in the North Pacfic:			
Character	***M. similis***	***M. jerrica***	***M. bousfieldi***
Length	4-7 mm	10-14 mm	9-12 mm
Cx1 anterior angle	rounded	acute	very acute
Gn2 male, palmar angle	ca 120°	>150°	ca 120°
Gn2 male, palm	2 humps 2 excavations	1 U-shaped excavation	smooth with defining tooth
Gn2 female	similar to male	smooth, with defining tooth	smooth, with defining tooth
P5-7, basis	widened and lobed	stout, l:b<2	elongate, l:b<2
U3 distal spines	long, >1/2 length of rami	short, <1/2 length of rami	> length of 1/2 rami
Telson distal spine	clearly > 1/2 length of telson	clearly < 1/2 length of telson	= 1/2 length of telson
Telson additional lateral spine	shorter than distal one	< distal one	same length or longer than distal one

USNM 291421, Carmel Point, Hancock coll., 48-1-6, 30-31 Dec., 1963 - 1 male 9 mm, 1 female 11 mm, 2 juv.

USNM 291422, La Jolla, Scripps Inst., near pier, in kelp holdfasts washed up on beach after storm, Olga Hartman coll., 4 Mar., 1938 - 1 male 12 mm, 1 female.

USNM 291423, La Jolla, Scripps Inst., Waldo Schmitt coll., June, 1935 - + 30 males , females 10-12 mm.

Diagnosis: Length 10-14mm; peduncle art1 < art2; Cx 1 moderately produced to blunt corner anterodist-ally. Gn2 margins widening distad, not parallel; palm scarcely oblique (corner > 150°), in male with one subquadrate hump in the middle and one U-shaped excavation proximally; in female, smooth until prominent defining tooth. U3 rami spines ca. half length of rami. Telson with 1 strong spine (about half length of T) and another on the outer margin of each lobe (length similar, slightly shorter).

Description: A1 acc. flag. about half length of flagellum; peduncle art 1 clearly shorter art 2. Md palp art1 obliquely lengthened distally, art 3 < art2.

Coxa 1 moderately produced to blunt corner anterodistally. Gn2 male, carpus with one deep dorsal impression; palm scarcely oblique (corner > 150°), often asymmetrical; in male with 1 subquadrate hump in the middle and one U-shaped excavation proximally; Gn2 of female smooth up to prominent defining tooth.

P3-7 dactyls bifid, in adult specimens shorter than 1/2 propodus length; P5-7 basis with postero-distal lobe developed, wider than deep, basis l:b < 2.

U3 rami truncate distally, spines ca half length of rami. T deeply cleft, each lobe distally incised, with 1 strong spine sitting there (about half length of T) and another on the outer margin of each lobe (similar length or scarcely shorter).

Etymology: Jerry Barnard described and figured this species in one of his very first papers. With this dedication, TKS wants to remember his patient interest in the problems of a young amphipodologist when meeting him in Schlitz (Germany) or Verona (Italy) and his open doors in his Smithsonian lab as well as his home near Washington on later occasions.

Distribution: From SE-Alaska, British Columbia, Washington to Oregon.

Ecology: Barnard (1954:18) reports on 50 specimens collected intertidally at Cape Arago, Oregon, and one female dredged at 35 miles west of Depoe Bay at 109-135m depth, which could have been washed away from the coast.

Remarks: The smaller material from Hinks Island (Fig. 8) is similar, but differences such as Cx1 anterior corner or largeness of eyes should be proven with larger series of material.

MAERA SPECIES (sensu lato)

It is impossible to study all (approximately 80) known species of the former genus *Maera* at the same time. Krapp-Schickel (2000) defined the genus *Othomaera*, but all the Southern Atlantic and Indian species must wait for detailed checking (and hopefully grouping). It may seem very unsatisfactory, but at the moment there seems no other solution than to leave them in the mixed pool of "*Maera* sensu lato".

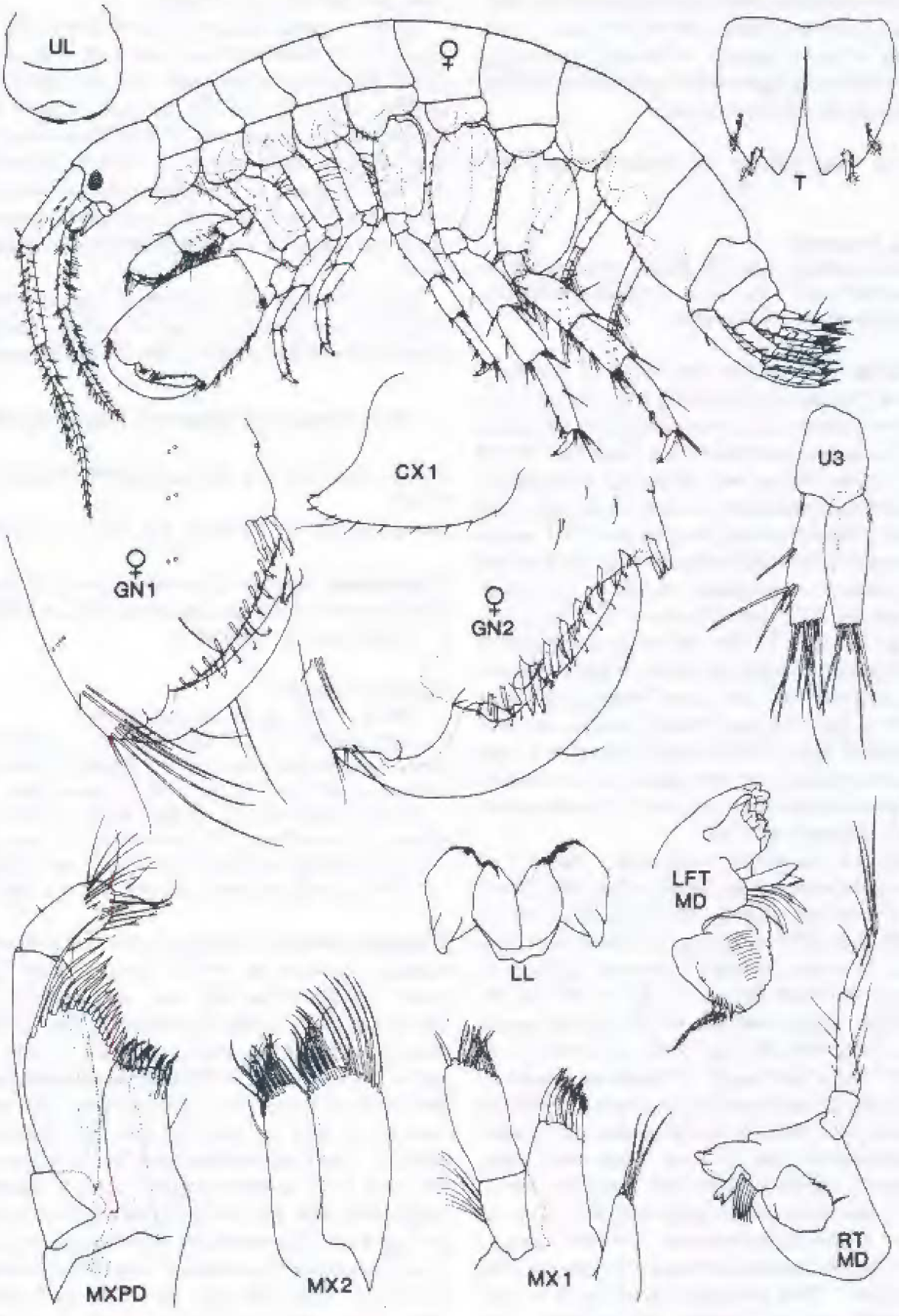

Fig. 9. ***Maera* sp.** (sensu lato) (nr. ***rathbunae*** Pearse). Female 5 mm, Marsh Pt., SE Alaska.

female with immature oostegites, which does not seem to belong to any described clade of this region. As we do not know the morphology of the male, we can only offer the following figure with a preliminary description and wait for further material.

Maera sp. sensu lato (nr. *rathbunae* Pearse, 1908). (Fig. 9)

Material examined:

CMNC 1999-0024, Marsh Pt., Prince of Wales I., Alaska, E. L. Bousfield coll., 1 June, 1961 - 1 female juv., 5.0 mm, in alcohol, partly mounted on slide.

Description: A1 acc. flag. half length of flagellum. Eyes oval. Md palp art 1 rounded, art 3 clearly < art2, very poor setation. Cx1 anterodistally produced to tooth. Gn1 carpus not notched. Gn2 propodus widened distally, palm oblique, well defined by wide palmar excavation and prominent defining tooth; palm with proximal U-shaped excavation; dactylus with 1 seta on outer margin, inner margin smooth. Peraeopod dactyli simple, basis P5 rectangularly widened, no posterodistal lobe, but 90° corner; P6 with small lobe, posterior margin rounded, P7 lobe well developed, posterior margin regularly rounded, propodus strongly widened. Ep 1-3 posterodistally with small tooth, lengthening from Ep1 to Ep3; U3 rami distally truncate, spines > half length of rami. Telson small, broader than long, deeply cleft, lobes distally emarginate, with one short, robust spine and a plumose seta, and 1-2 plumose setae on outer margin of each lobe.

Remarks on the *Maera rathbunae* - clade: This species could belong to an Atlantic clade with *Maera rathbunae* Pearse, 1908 (p. 29-30, fig. 3; 13mm, cf. also Ruffo et al. 2000: 27-29, fig. 14) known only from Florida. *Maeropsis perrieri* Chevreux, 1919: 9-10, Chevreux (1927:104-105, pl. IX, fig. 1-19) (NW Africa, 9-12m depth), and *Maera excavata* Mateus & Mateus, 1986: 148-150, fig. 10-15. All have A1 acc. flagellum about half length of flagellum (shorter in *Maera* sensu stricto, longer in *Quadrimaera*), Md palp art 3 < art 2 (like *Maera*), Gn2 propodus with oblique, well defined palm, dactylus outer margin with 1 seta, P3-7 dactyli simple, P5-7 articles strong and broadened, U3 rami truncate and spinose distally (U3 of *M. excavata* is obviously immature). All have a deeply cleft and distally emarginate telson with only one long apical spine. Their ecological distribution is from greater depth and not intertidal [*M. rathbunae* was described from 175-220m (in Ruffo et al. 2000, depth is erroneously measured in feet and not fathoms); *Maeropsis perrieri* from 700m].

Maera revelata Krapp et al. (1996:28-32, fig.1-3; 8mm, from W-Mediterranean) may have to be considered in the vicinity of this clade. *M. brevispina* Kim & Kim, 1991 (pp. 331-332, fig. 8,9; 12.5mm from Korea) also seems quite similar. The former could well be an aberrant member, entering from the Atlantic to the western coasts of the Mediterranean, while the latter is insufficiently described and figured; however, the biogeographical connection seems quite improbable.

For the moment this clade has to remain together with the "*Maera* sensu lato" species and wait for more detailed knowledge of the Southern Atlantic fauna.

Maera (sensu lato) *diffidentia* (Barnard, 1969)

Meximaera diffidentia Barnard, 1969b:209-211, fig. 21,22.
Maera caroliniana Bynum & Fox, 1977:11-14, fig. 7.

Type locality: Bahia de Los Angeles, Baja California, Reef between Isla Ventana and Isla Cabeza de Caballo, C. Hubbs coll., 21 April, 1962.

Material examined:

USNM 111497- male 5.8mm (Holotype).

USNM 152746, 152747, 152748, 152749, 152750 (type series of *Maera caroliniana*), Bogue Sound, 28 Nov. 1966 and Lockwood's Inlet, 29 Dec. 1963, North Carolina.

USNM 174959-61, acc. 337093, BLM-SABP-TI, off Florida, 31 Aug- 4 Sept., 1977, 15m-26m depth - many spec.

USNM 276968, off Florida, 52-125m, 5 June, 1983.

USNM 211945, off Florida, 58.6 m, 24 April, 1981.

Diagnosis: Barnard defined *Meximaera diffidentia* as a species between the *Maera* - group and the *Ceradocus* - group, having Mx2 inner margin densely setose for half of its length. But neither in the examined material, nor in the description of *Maera caroliniana* by Bynum & Fox (1977) (here placed in synonymy) is this character found: the maxillae have many short hairs on the inner margins, but setae are present only apically. *Meximaera* should therefore be withdrawn. Md palp art 1 distally rounded and not obliquely lengthened, art3> art2. Mxp palp dactylus = art 4 short, not unguiform. Eyes reniform. A1 acc. flag. very short. Coxa 1 anterodistally rounded. Gn2 palm corner scarcely defined, about 150-160°; dactylus with 1 seta on outer margin. Peraeopod dactyli simple. U3 distally truncate, clearly visible art2 on outer ramus. Telson deeply cleft, with 2-3 spines on outer margins, distally

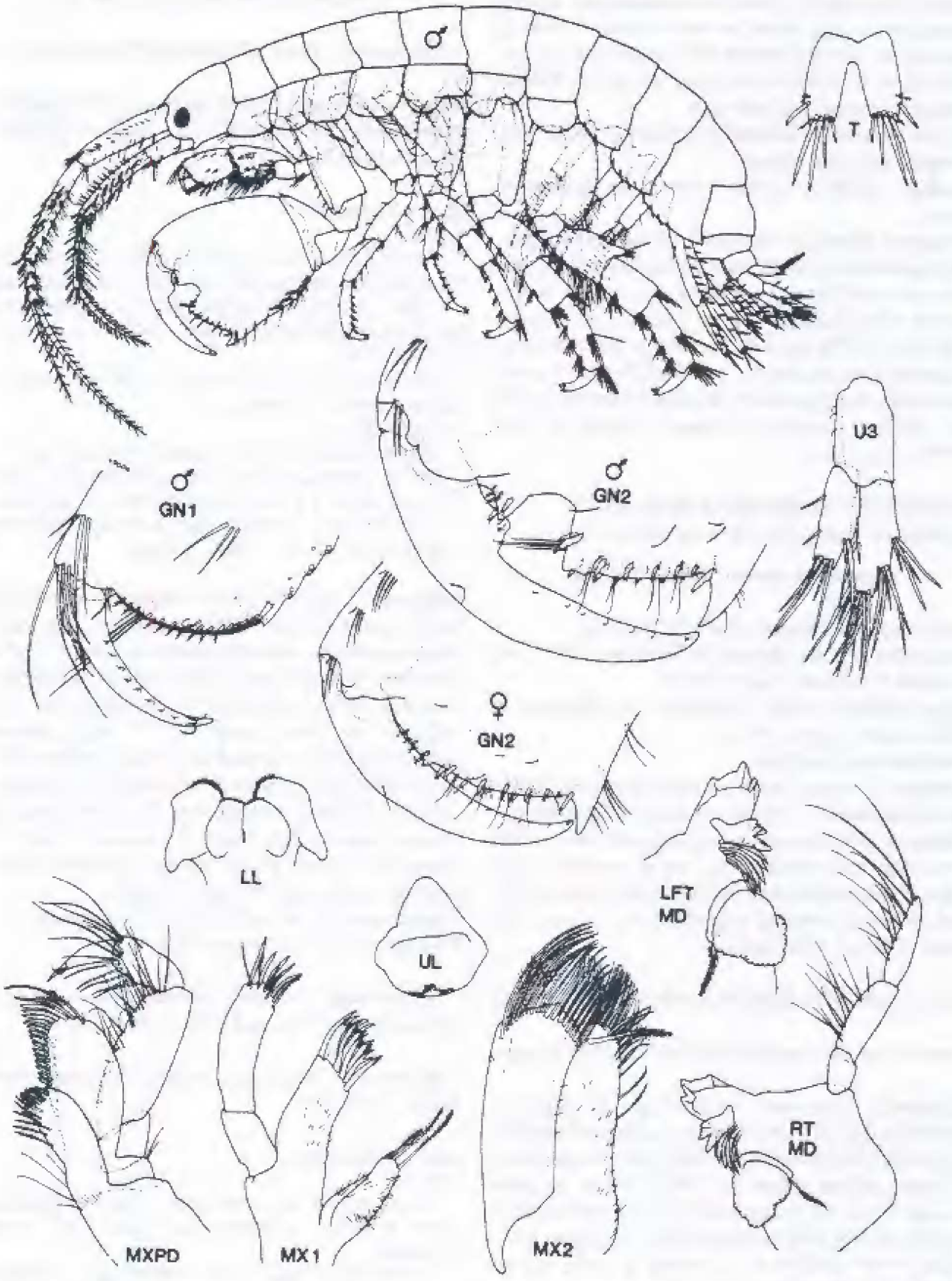

Fig. 10. ***Quadrimaera carla*** n. sp. Female 6.5mm, Queen Charlotte Is., Houston Stewart Channel, B.C.

deeply cleft, with 2-3 spines on outer margins, distally emarginate,1 long spine on outer corner. 1 short in excavation. Barnard (1969b: 209) opines that this species might be a derivative of the *Maera* line with an unusual shape of Mxp palp art4.

Distribution: Baja California (tropical Pacific) to North Carolina (Atlantic Ocean).

Ecology: Rocky intertidal to 24m in the offshore islands.

Remarks: Bynum & Fox (1977) referred to two abundant species from North Carolina; besides *M. diffidentia* was also found *Maera williamsi* , here given in synonymy with *Anamaera hixoni* Thomas & Barnard, 1985 (p. 197-203, fig. 4-7). As the first was also found along the Mexican coast of the North Pacific, it seems reasonable to expect a similar range extension for the now defined *Anamaera williamsi* (Bynum & Fox, 1977, nov. comb.).

LUPIMAERA BARNARD & KARAMAN

Lupimaera Barnard & Karaman, 1982: 174

Lupimaera lupana (Barnard, 1969)

Maera lupana Barnard, 1969a: 122, fig. 20.
Lupimaera lupana. Barnard & Karaman 1982: 174; Barnard & Barnard 1983: 625-626.

Type locality: Goleta, California (on rhizomes of *Macrocystis pyrifera* , 3m)

Distribution: California.

Ecology: It seems extremely well adapted to a life in the interstitium (cf. similar reduction in *Stenothoe*).

Remarks: This is a quite aberrant small species with very short A1, rounded Cx1, ovoid propodus Gn2, stout, broadened basis on P5-7 and short, bifid dactyli, and strikingly reduced appendices on urosome, all beset with very short spines.

QUADRIMAERA KRAPP-SCHICKEL & RUFFO

Quadrimaera Krapp-Schickel & Ruffo, 2000: in press.

Diagnosis: Eyes round. A1 acc.flag > 0.5 length of flagellum. Md palp art 1 distally rounded, art3 equal or longer art2. Gn2 propodus in both sexes subquadrately widened, palmar corner 90°. Gn2 dactylus on outer margin 1 seta; often excavated on inner margin. P5-7 dactyli usually bifid (exception only *Q. vigota*). U3 distal spines usually > 1/2 length of rami. Telson distally incised, spinose.

For key to species see Krapp-Schickel & Ruffo (2000).

QUADRIMAERA REISHI- CLADE

Quadrimaera reishi (Barnard, 1979) nov. comb.

Maera reishi Barnard, 1979: 83-86, fig. 45-47 (partim)

Type locality: Isla Espiritu Santo, Gulf of California, algae on rocks, 0.3 - 1m.

Material examined:

MEXICO:

USNM 142568, San Gabriel Bay, Isla Espiritu Santo, Baja California, intertidal, 28 Nov., 1971 - male (**Holotype**)

USNM 142569, San Gabriel Bay, Isla Espiritu Santo, Baja California, intertidal, 28. Nov., 1971 - 1 specimen.

CALIFORNIA:

USNM 152/786 165 5, Venice, S. California, coll. W. Schmitt - 1 male, 1 female , 1 juv.

GALAPAGOS:

USNM 142320 (260778) - 2 males, 1 female, 2 juv.;

USNM 142571, Isla Santa Cruz, Academy Bay, intertidal, coll. & det. J. L. Barnard, 16/02/1962 - 2 specimens.

USNM 142572 Isla Santa Cruz, between Tortuga and Academy Bay, 7-10 m. - 1 male, 1 female.

Diagnosis: Length 5-5.5mm. Cephalic anteroventral corner narrow-elongate. Md palp art3 > art2. Gn2 basis large and spinose, propodus slightly expanded distally, palm transverse, defined by large tooth, palm with deep V-shaped incision, dactylus not excavated, but with acclivity on inner margin, P5-7 basis narrow, ovatorectangular, posterodistal corner angular, P3-7 dactyli bifid. Ep1-3 posterodistally with tooth, ventrally spinose. U3 distally truncate, heavily spinose, tiny art2 on outer ramus; inner ramus 4/5 length of outer. T deeply cleft, lobes apically obliquely truncate, with 4 long spines subequal or longer T length.

Distribution: Southern California to Galapagos.

Ecology: 0.3-10 m, algae on rocks.

Quadrimaera chinarra (Barnard) nov. comb.

Maera chinarra Barnard, 1979, p. 86-87, fig. 29.

Type locality: Cabo San Lucas, Baja California, North Pacific, intertidal.

Material examined:

MEXICO:

USNM 142556, Baja California, 7 miles E. Cabo San Lucas, intertidal, J. L. Barnard coll., 4 Dec. 1971 - male (**Holotype**).

USNM 142560, Ibid. - 1 juv., 142557, Ibid. - 1 female; 142558, Ibid. - 1 spec.; 142561, Ibid. - 1 male; 142562, Ibid. - 3 spec.; 142563, Ibid. - 2 spec.; 142564, Ibid. - 4 spec.; 142559, Ibid. - 1 female.

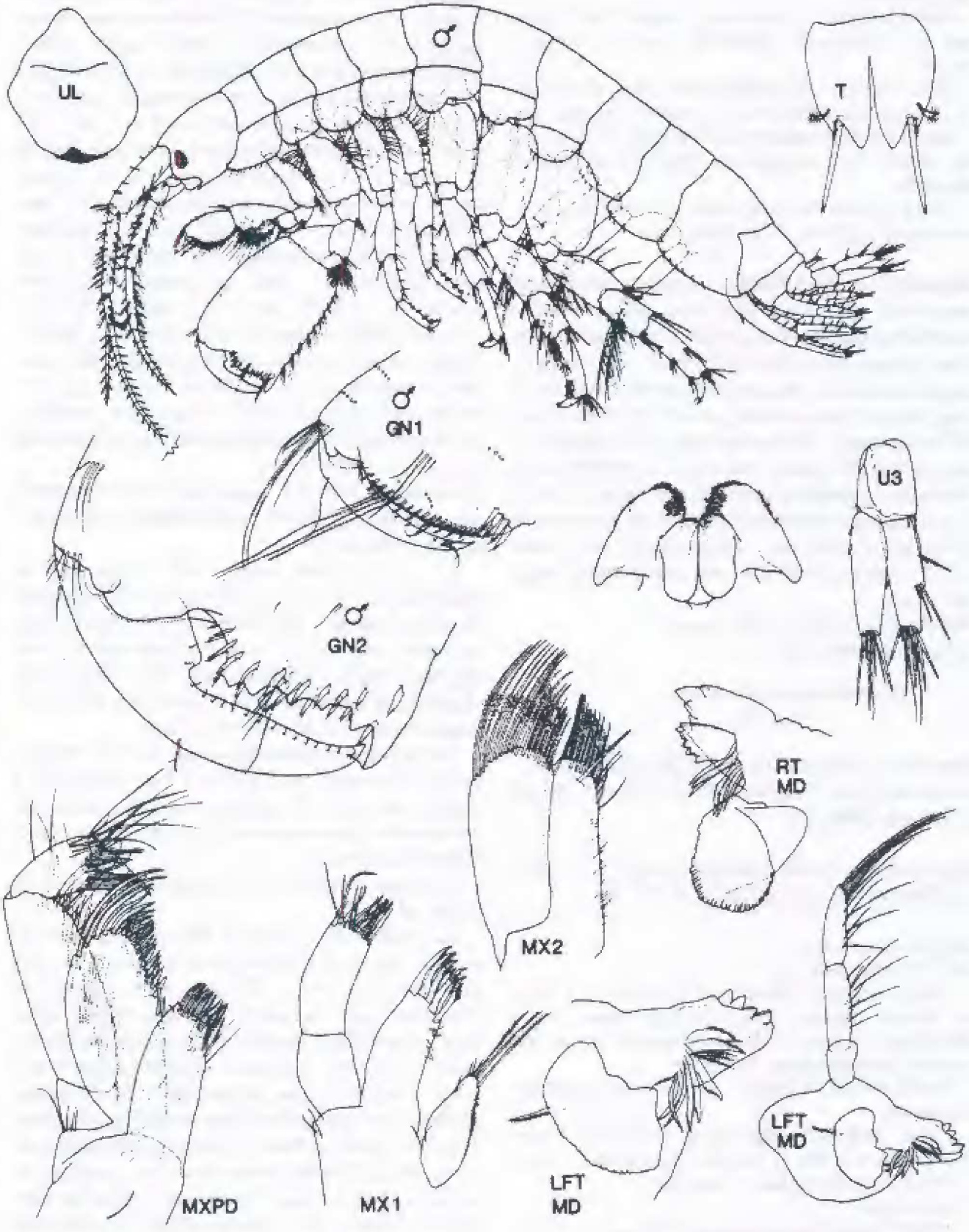

Fig. 11. ?*Quadrimaera vigota* (Barnard, nov comb.). Male 8.5mm, Marsh Pt., SE Alaska.

GALAPAGOS:

USNM 142318, Isla Santa Cruz, Academy Bay, intertidal, J. L. Barnard coll., 16/02/1962 - 3males, 1 female, 2 juv. ind.

USNM 142319, Tower Island, Darwin Bay, rocks, 1 m, J. L. Barnard coll., 27/01/1964, - 12 males, 9 females +juv.

USNM 142566, Tower Island, Darwin Bay, J. L. Barnard coll., 29 Jan., 1964 - 4 specimens; USNM 142567, Ibid. - 3 specimens.

USNM 142565, Isla Santa Cruz, Academy Bay, J. L. Barnard coll., 20 Feb., 1962 - 4 specimens.

Diagnosis: Length 3.5-4mm. Cephalic anteroventral corner with obsolescent sharp cusp. Md palp art3 < art2. Gn2 propodus not expanded distally, palm transverse, defined by medium tooth, palm with 1 deep U-shaped incision in male, smooth in female, dactyl with large inner acclivity in male, absent in female or juv. P5-7 basis narrow, ovatorectangular, posterodistal corner angular. P3-7 dactyli bifid. Ep1-3 posterodistally with tooth, ventrally spinose. U3 rami broader than in *Q. reishi*, apically truncate and spinose, inner ramus 3/4 length of outer one. Telson deeply cleft, lobes apically concave, with 3-4 long spines, some longer than telson.

Distribution: Mexico to Galapagos

Ecology: Intertidal, 0 -1 m.

Quadrimaera carla n. sp.

(Fig. 10)

Maera reishi Barnard, 1979: 83, fig. 45-46 partim

Maera inaequipes Barnard & Reish, 1959: 25, 26, fig. 5; Barnard 1969a: 121.

Type locality: Queen Charlotte Islands, B. C., Houston Stewart Channel, 52°09'N, 131°07'W.

Material Examined:

BRITISH COLUMBIA:

CMNC 1999-0023, Queen Charlotte Islands, B. C., Houston Stewart Channel, Queen Charlotte Islands, scallop dredge, shell, 15-18 m, C. McLean Fraser coll., 22 July 1935 - male 6.5mm (**Holotype**), slide mount.

CMNC 1999-0023 (Ibid.) - female 6mm (**Paratype**), slide mount.

CMNC 1999-0023 (Ibid.) (Acq. 1955-107) - 1 male 6mm, 1 female 5.7mm, 1 ?sex 5.7mm, in alcohol, 1 slide.

CMNC 1999-0023 (Ibid.) - male 5mm.

CALIFORNIA:

USNM 291424, Venice, southern California, coll. W. L. Schmitt coll. - 2 males, 4 females, 3 juv.

USNM 291424, Ibid, A. Hancock sample 1042-40 (sub *M. inaequipes* det. Barnard) - 3 males, 3 females.

Diagnosis. One of 3 species of *Quadrimaera* known from the northern and central Pacific east coast, distinguished by: anteroventral cephalic corner pointed [obsolescent in *Q. chinarra* (Barnard, 1979)]; A2 gland cone reaching 2/3 of art3 (vs. overreaching art3 in *Q. reishi*); Md art2 = art 3 (vs. art2 > art3 in *Q. ch.*); Gn2 palm U-shaped to subquadrate incision in male, smooth in female, (vs. V-shaped incision in *Q. r.*), palmar corner clearly defined by prominent tooth (vs. blunt right angle or short tooth in *Q. ch.*), dactylus inner margin proximally thickened (vs. smooth *Q. r.*); P7 basis hind margin lobed and posterodistal corner rounded (vs. straight, corner right angled at *Q. r.*); T each lobe obliquely truncate (vs. excavate in *Qu. ch.*) distally, with 4 (vs. 3 in *Q. ch.*) strong distal spines shorter than T itself (vs. as long as T in *Q. r.*, *Q. ch.*); Telson distomarginally with 1 robust spine, similar to the distal ones (vs. no spine laterally, but plumose seta in *Q. ch.* as well as *Q. r.*).

Description: Male 5-6.5 mm. Ep2-3 postero-ventral corner acutely produced, ventral margin with 3 and 4 spines respectively.

A1 = > 1/2 body length, ratio of arts 1:2:3 of peduncle = 2 : 2.3 : 1, art 1 with 3 spines and many setae on ventral margin, flagellum distinctly shorter than peduncle, with up to 19 arts, acc. flagellum > half of flagellum length, with up to 8 arts. A2 = 3/4 A1, ratio of arts 4:5 of peduncle = 1.4:1, gland cone 2/3 of art3, flagellum very setose, with up to 9 arts.

Md palp art 1 distointerior corner rounded, arts 2-3 subequal in length, art 2 with ca 7 long setae and 3-4 shorter ones, art 3 with a group of shorter medial setae, 3-4 distally; Mx1 narrow, Mx2 outer plate distinctly wider than inner one.

Cx1 antero-ventral corner rounded, not or scarcely produced.

Gn1 basis with 3 groups of long setae on posterior margin; carpus with incision dorsally; propodus palm delimited by a row of 5-6 inner spines, no special prominent spine on palmar corner; propodus rather large, palm oblique; carpus clearly > propodus. Gn2 in holotype asymmetrical, basis anterior margin with 6 spines, the distal spines not stronger than the medio-proximal ones, posterior margin with a few long setae; propodus broadly subrectangular, palmar margin with one U-shaped to subquadrate excavation; palm delimited by a short, triangular tooth, with a proximal inner spine; dactylus inner margin proximally thickened, with a right angle near proximal end of palmar excavation.

P3-7 dactylus with bifid nail. P3-4 similar in shape,

Differences in 3 sibling *Quadrimaera* species (*Q. reishi* -.clade) of Northern and central Pacific East-coast.

	Q. reishi	*Q. chinarra*	*Q. carla*
Length	4.5-5.5mm	3.5-4mm	5.5-6.5mm
Anteroventral cephalic corner	acute	obsolescent	acute
A2 gland cone	overreaching art3	1/2 art3	reaching 2/3 of art3
Md palp	art2=3	art2>3	art2=3
Gn2 palmar corner	prominent acute tooth	tooth lacking or short, not much prominent	prominent triangular tooth
Gn2 palm	narrow V-inc.	wide U-incision	wide U-incision
Gn2 dactyl inner margin	smooth	proximally thickened	proximally thickened
P7 basis posteror margin	straight	broadened	rounded
P7 basis postero-distal corner	right angle	short lobe	round lobe
Telson distally	without tooth on corners	truncatewith tooth on inner and outer corner	excavated,with tooth on outer end, obliquely truncate
T distomarginally	1-2 plumose setae	2 plumose setae	1 robust seta, some times 1 plumose seta

basis with 2 long setae and some short spines on posterior margin, and with a row of short spines on anterior margin. P5 basis narrowly ovato-rectangular, with marked posterodistal rounded lobe, posterior margin feebly convex, nearly smooth, with few short setae, propodus without setae on posterior margin. P6 basis similar in shape to P5, but wider, posterior margin scarcely convex, in P7 basis clearly widened and regularly rounded on posterior margin; postero-distal corner of merus P5-7 with short setae, not reaching 1/2 carpal length; P6,7 propodus posterior margin with a medial tuft of setae not reaching end of propodus.

U3 stout, rami broad and flat, distally truncated, with numerous spines, inner ramus clearly shorter than outer, art 2 of outer ramus rudimentary, barely visible in between the spines. Telson about as broad as long, lobes not distally incised, but truncate, with acutely produced distoexterior corner, and 4 distal spines increasing in length from inner to outer side, the longest still shorter than telson, distolaterally with 1 strong spine of the same structure like the distal ones, and 2 short subdistal simple setae.

Female (ov.) 6 mm. Similar to male. Gn2 shorter than in male, excavation of the palmar margin absent. Oostegites very slim.

Etymology: We wish to honour the late "Babs" Carl (Josephine F.L. Hart, wife of G.C.Carl, former director of the Royal British Columbia Museum), who contributed enormously to knowledge of malacostracan crustaceans of the Pacific coast of Canada. The specific name reminds also of the type locality in the Queen Charlotte Islands, the French diminutive of the Latin name Carla.

Distribution: It seems that this new species has the northernmost distribution within this genus. The type comes from British Columbia and additional material

from Californian coasts, while *Quadrimaera reishi* reaches from the Galapagos to southern California, and *Q. chinarra* is known from Baja California, the Californian Gulf and the Galapagos Islands.

Ecology: Depth range 27-33m. Sand, shell fragments, on pilings (Barnard & Reish 1959, see remarks). In *Amaroucium* sp., in *Macrocystis* holdfasts at 3m, in tunicate and polychaete tubes, with *Spheciospongia* sp., *Phragmatopoma* and *Phyllospadix* - coralline (Barnard 1969a: 121,122).

Remarks: *Maera reishi* Barnard, 1979 (p. 83 partim discussion on Californian material) could well be this species: the type material of *reishi* shows an extremely narrow V-shaped excavation like in fig. 46 G2, while "vG2o" could be the present new species. Also *Maera inaequipes* Barnard & Reish, 1959 (p. 25, 26, fig. 5 concerning Newport, California) matches the present description well. *Maera reishi* Berents, 1983 (p. 129 fig. 23 nec *reishi* Barnard, 1979) from Australia seems quite similar to the present new species, but Gn2 of the male is also excavated similarly (buy smooth in the new species) and the telson has a prominent tooth on disto-interior corner. The taxonomic status of this material should to be checked in more detail.

? Quadrimaera vigota (Barnard), nov. comb.
(Fig. 11)

Maera vigota Barnard, 1969a: 125-125, fig. 21.

Type locality: Cayucos, central California, 5-6 January 1962, J. L. Barnard coll., on cobbles buried under small boulders.

Material examined:

CMNC Collections, Marsh Pt., SE Alaska - 1 male 8.5mm.

USNM 128433 Type-series, type locality and date - 1 female ov. 7.5mm, 1 male 7mm, 2 juv., male 6mm, 4 juv.

USNM 291426 Carmel Point, central California, Allan Hancock foundation Sta. 48-H-4, 30-31 Dec., 1963 - 1 female ov. 7.5mm.

Diagnosis: A1 acc. flag. > 0.5 flagellum like other *Quadrimaera*, but eyes reniform. Md palp art 1 distally rounded, art2 = art3. Upper lip thickened ("Linguimaera"-like). Basis of Gn1,2, P3,4 posteriorly unusually densely setose; Gn1 carpus anteriorly not notched; Gn2 propodi, asymmetrical, otherwise sexually not different; not as subquadrate as typical for genus, but rectangular with parallel anterior and posterior margin; palmar incision not in the middle of the palm, but right at the beginning, near dactylus insertion; dactylus with 1 seta on outer margin. P5-7 dactyli simple (only exception in genus). U3 rami truncate, many distal spines longer than half legth of rami; outer ramus with minute art2. Telson, outer margin of lobes subdistally notched, where 1 single strong spine is inserted (length about the same as T length).

Colour: pink.

Distribution: Gulf of Alaska to central California.

Ecology: Abundant on buried cobbles, on sponges and tunicates; intertidal.

Remarks: Our figures match well the one given in Barnard (1969a:125, fig. 21), except for the much stouter and shorter U3 given for the Californian male of 9mm compared with the 8.5mm male from S-Alaska, where U3 rami are clearly longer than double width. But in the Californian type series, determined by Barnard, this U3 shape varies depending on age. Barnard (1970, p. 147-150, fig. 90,91) discusses the allometry in U3 of *Maera kaiulana* Barnard, 1970, another aberrant member of this species-complex which is otherwise very homogeneous in the Pacific region.

ELASMOPUS COSTA, 1853

Elasmopus Costa, 1853:170, 175 (*Elasmopus rapax* Costa, 1853); Stebbing 1906:441.

Diagnosis: Similar to *Maera* sensu stricto, except in the shape of Md palp art3, but the generally stouter and more well pigmented appearance of *Elasmopus* is helpful too. A1,2 moderate to elongate; A1 much > A2, acc. flagellum 1 or more arts. Md palp art 3 strongly falciform, with D and E setae. Inner lobes of lower lip present. Mx1,2 not or weakly setose on inner margins, Mx1 inner plate ovate, Mx2 without oblique row of setae, only few setae medioapically. - Gn1,2 different in size and shape, palms oblique, in Gn2 usually sculptured with specific tooth formulas, dactylus elongate or short, sometimes riding onto inner face of propodus. P5-7 generally short, stout. Uropods 1,2 subequal rami, peduncle U1 with basofacial spine. U3 scarcely extended, magni- to parviramous, at least outer ramus broad, short, strongly spinose; art2 vestigial or lacking. T deeply cleft (but Shoemaker 1933 reported fused mutants), apically spinose, each lobe often apico-medially excavated.

We do not fully treat the more than 60 known species of *Elasmopus* here, but we discuss one species in more detail because it is found unusually far North for the mainly tropical distribution of the genus.

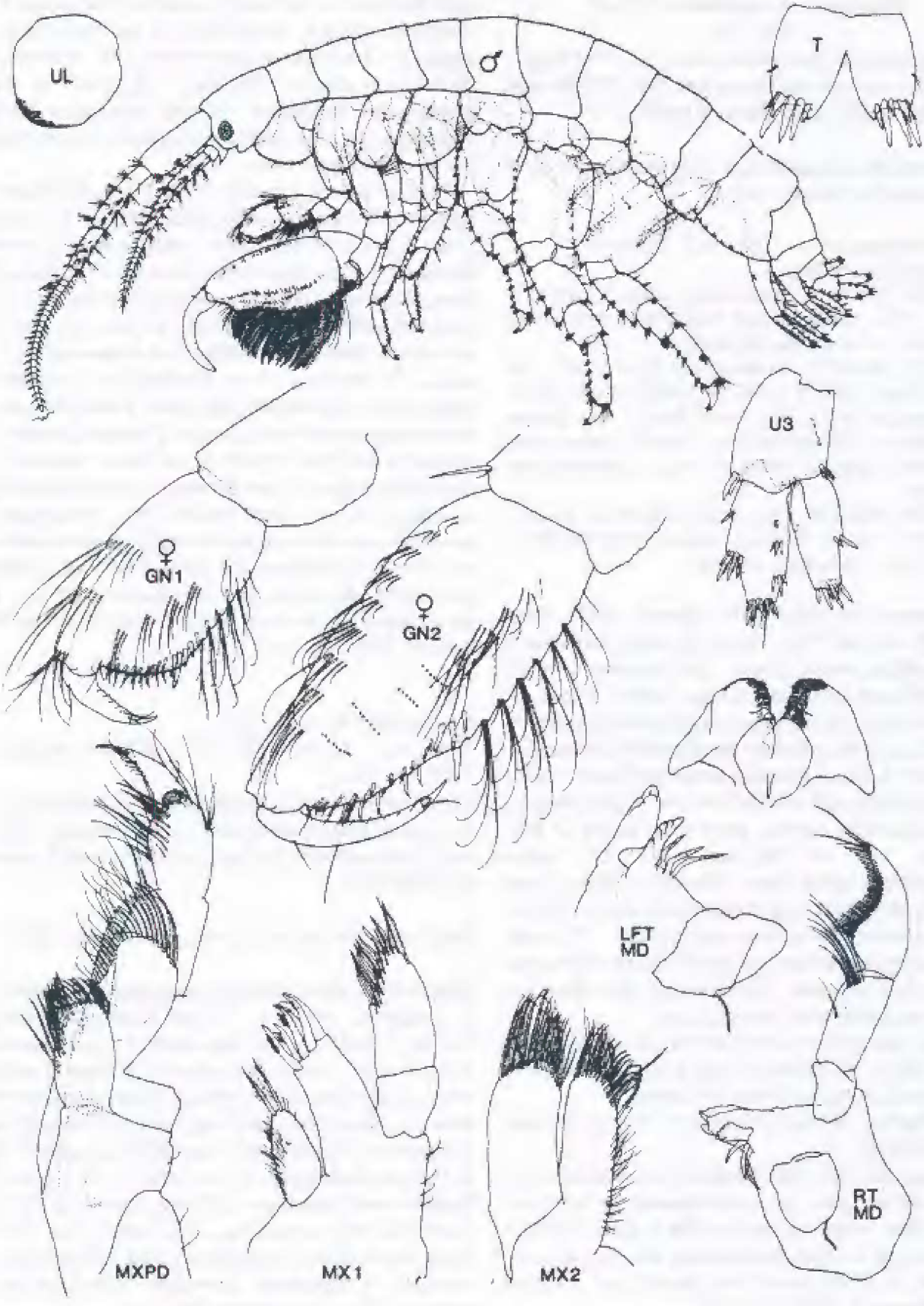

Fig. 12. ***Elasmopus*** cf. ***antennatus*** (Stout). Male 8.5mm, Vancouver I., Gooding Cove, B. C.

Elasmopus **cf.** ***antennatus*** **(Stout)**
(Fig. 12)

Neogammaropsis antennatus Stout, 1913: 645-646.
Elasmopus antennatus Shoemaker 1941:187; Barnard 1962:88-91, fig. 12,13; Barnard 1969a: 115.

Type locality: Laguna Beach, California, from tufts of coralline algae between tides.

Material examined (E. L. Bousfield, collector):
BRITISH COLUMBIA:

CMNC 1999-0010, Edward King Island, Vancouver I., 10 Jul., 1976 - 1 male, 1 female incomplete, 1 male 10mm., 3 females ov. 4mm (other species?).

CMNC 1999-0011, Gooding Cove, Quatsino Sd., Vancouver Island (50°24' N, 127°57'W), dredge 12-14m, gravel, sand, algae, 16 Aug., 1975 - 1 male 7mm, 1 male 8.5mm, in alcohol, part mounted on slide; 1 female 6.5mm in alcohol, partly mounted; 1 female ov. 4mm, in alcohol (other species?),

CMNC 1999-0009, Cape Beale, Vancouver Island, 19 July, 1970 - 1 male 10.5mm, in alcohol, partly mounted; 1 male 10mm, 1 male 8mm, in alcohol.

Diagnosis (after Stout 1913; Barnard 1962)**:** Body dorsally smooth. Gn1 (male) propodus rectangular, palm oblique, well defined. Gn2 propodus sexually very different, palm very oblique, heavily setose, not defined, small process near hinge of dactylus; medial face of propodus with ridge and slight bilobation; palm shorter to subequal dactylus, about half length of hind margin. Right and left Gn2 similar. Gn2 (female) small, propodus narrow, palm < 1/2 length of hind margin, with 3-4 defining teeth. P5-7 merus anterodistally lobed, basis widened, in P5,6 margins straight, in P7 hindmargin nearly semicircular. Ep1-3, small posterodistal tooth curved upwards. U3 small, rami narrowing distally, abruptly truncate, outer ramus longer than inner one. Telson deeply cleft, lobes distally emarginate, with 3 strong spines.
Colour: pale grayish lavender with the appendages a little darker, the antennal flagella with two rings of white and dark violet (Stout 1913:646).
Distribution: British Columbia to Baja California, Pacific Ocean.
Ecology: Shallow water, frequent in intertidal amongst algae and surf-grass, or on algal bottoms in 5m, down to 10-18m. Absent in sand or silty bottoms (Barnard 1962:91). In *Macrocystis* holdfasts, with tunicates and sponges, in *Phyllospadix* roots, brown algae, coralline algae (Barnard 1969a:115-117).
Remarks: The material found in British Columbia partly matches the original description, but partly contains fully mature but smaller animals. The type of *E. antennatus* Stout is apparently lost and must be re-established following detailed study of all ~60 known *Elasmopus* species. The rich collections at the Smithsonian Institution, offering specimens from Galapagos and from California (Scripps Inst. samples) should give helpful hints.

Barnard also reported from California *Elasmopus holgurus* Barnard (Barnard 1962, 1969a), "*E. rapax* Costa "(Barnard 1962, 1969a) (which probably is not the Mediterranean type species although it is cited also from southern Norway), *E. mutatus* Barnard (in Barnard 1962,1969a, as a subspecies of *E. rapax*), and *E. serricatus* Barnard (in 1969a, as a subspecies of *E. rapax*). Except for *E. rapax* reaching 11mm, all other species have a similar body length of about 8mm, and the females are also quite similar. Diagnostic features are the telson (evenly truncate and heavy spinose in *serricatus, holgurus*, emarginate and scarcely spinose in *antennatus*, with distal rounded lobe and marginal notch in *rapax*, distal pointed lobe plus marginal notch in *mutatus*; furthermore the palmar teeth are totally wanting in *antennatus*, one triangle in *holgurus* , a hump with 2 elevations in *rapax* , rectangular hump in *mutatus* and *serricatus*).

CERADOCUS **Costa, 1853**

Ceradocus Costa, 1853:170, 1857:224; Stebbing 1906:430 (part.).
Ceradocus (subgen. *Denticeradocus*) Sheard 1939:277 (with type *Gammarus rubromaculatus* Stimpson, 1856) fully synonymized with *Ceradocus* by Barnard & Barnard 1983:614 .

Type species: *Ceradocus orchestiipes* Costa, 1853.

Diagnosis: Metasome and urosome segments partially or completely serrate or toothed posteriorly, rarely smooth. Lateral cephalic lobes rounded, ventroanterior incision, eyes present. Md palp art1 distally toothed, art2 medially enlarged, longest, art3 reduced, not shorter than art1, linear, with distal setae only. Mx1 inner plate triangular, margin densely setose. Mx2 inner plate with lateral and dorsal oblique row of setae. A1>A2, access. flagellum well developed. A2 long gland cone. Gn1,2 dissimilar, Gn1 carpus long, Gn2 carpus short. P5-7 basis posterodistally angular or lobed. U3 biramous, subequal, 1 segmented, lanceolate. Telson incised, lobes distally notched with short spine.
Distribution: marine, widely distributed in the tropics, with a few species in higher latitudes.

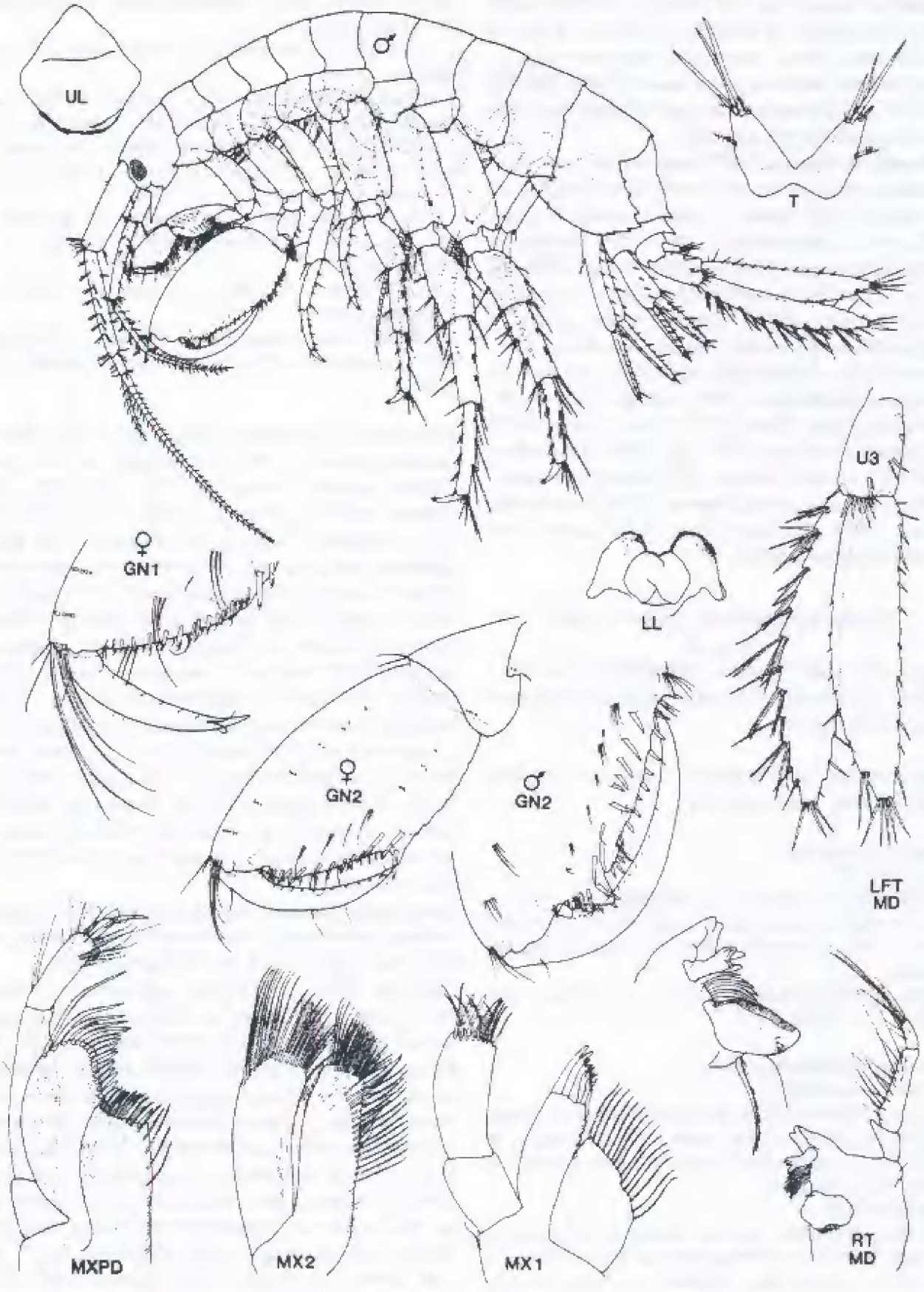

Fig. 13. ***Ceradocus spinicauda*** (Holmes). Male 10mm, Vancouver I., McCauley Point, B.C.

Remarks: *Ceradocus, Ceradocoides, Ceradomaera* and *Paraweckelia* (?) could be placed in a subgroup together with *Maera* sensu stricto because of the reduced Md art3, whereas *Quadrimaera* Krapp-Schickel & Ruffo, and *Othomaera* Krapp-Schickel, have long and unspecialized Md palp art3.

Barnard & Barnard (1983) reported 24 known species and presently there are 32: only 2 were found along the eastern Pacific coasts: *C. paucidentatus* Barnard, 1952, and *C. spinicauda* Holmes, 1908. Besides the Mediterranean type (*C. orchestiipes* Costa, 1853) and 12 spp. from South Africa, Madagascar and India, (which are very unlikely to occur in our regions), 3 partly dubious species are reported from Bermuda (*C. breweri, colei, parkeri*, all Kunkel, 1910), 1 from Cuba (*C. sheardi* Shoemaker, 1948), 12 from Central and W-Pacific: *chevreuxi* Sheard, 1939, *chiltoni* Sheard, 1939, *dooliba* and *hawaiiensis* Barnard, 1955, *haumuri* Barnard, 1972 *oxyodus* Berents, 1983, *ramsayi* (Haswell, 1879), *rubromaculatus* (Stimpson, 1856a), *selickennsis* Sheard, 1939, *shoemakeri* Fox, 1973, *wooree* and *yandala* Berents, 1983).

Ceradocus spinicauda (Holmes, 1908)

(Fig. 13)

Maera spinicauda Holmes, 1908:539-541, fig. 45.
Ceradocus spinicauda Barnard 1954:18-19; Barnard 1962: 86-88, fig. 10.

Type locality: San Nicolas I., California, 12 April 1904, Steamer Albatross, 60m.

Material Examined:
CALIFORNIA:

USNM 38556 - female 12mm (**Holotype**).

USNM 39021, off Santa Rosa Island, ~68-81 m, 15 April, 1904 - 1 male 11mm (**Paratype**) (not listed as such by Holmes).

USNM 39020, Santa Barbara Island, ~52m, 12 Apr., 1904 - 1 female ov. 10mm, 1 juv.

Additional material examined:
BRITISH COLUMBIA:

CMNC 1999-0007, McCauley Point, Vancouver Island, (48°24.04'N, 123°23.22.6'W), coll. G. W. O'Connell, 28 Aug., 1976 - 1 male 10mm, in alcohol, partly mounted on slide; 1 juv. 8-9mm.

WASHINGTON:

CNMC 1999-0006, San Juan Islands, Minnesota Reef, intertidal 48°31.7" N, 122°58.2' W, coll. R.M. O'Clair, 20 June, 1974 - 1male 12mm, 1 female ov. 10mm, in alcohol, part mounted on slides; 1 female 8.25 mm, in alcohol and part mounted on slide; 1 juv.

USNM 291427, San Juan Isl., coll. Frank A. Pitelka - 1 female ov. 12mm.

USNM 291428, Rocky Beach beyond False Bay, San Juan Isl., coll. J. L. Mohr, 1 Sept., 1948 - 1 male 12mm.

USNM 291429, SE of Rocky Bay, San Juan Ids., wash in ~42-59m dredge with *Volsella* and *Pecten*, 9 August, 1950 - 1 female ov., 1 female, 1 male 9-10mm.

USNM 291430, Brown Island, San Juan Isl., R. Fernald, coll., 4 Aug., 1948 - 5males, 1 female ov. 10mm.

CALIFORNIA:

USNM 2914321, San Diego, from kelp, Sept., 1998 - 6 specimens, 10mm.

USNM 291432, Laguna Beach, Orange Co., from kelp holdfasts washed up on beach after storm - 12 specimens, 9-11mm.

Diagnosis: Male 10-12mm, female ov. 9-11mm. Body dorsally toothed on Pls. 2,3 (small), Us 1,2 (well visible, upwards curved); Ep 1-3 with tooth, Ep3 posterodistal corner strongly serrate. A1 acc. flag. 1/4-1/3 of flagellum. Md palp art3<0.5 art2; Mxp palp propodus and carpus narrow and reduced, inner plate distally excavated; Gn2 assymmetrical, no sexual difference except size of propodi; palm defined by blunt elevation, distally two humps divided by V-shaped incision. P5-7 basis hind margin serrated, margins parallel, distoposterior and proximoposterior corner each lobed and lengthened, propodus strongly spinose. U3 rami lanceolate broadened, l:b >4, tip shortly truncated, not pointed, having 3-4 setae shorter than rami broad. Telson deeply cleft and narrowing distally, without emargination or incision, bearing 3 strong spines about as long as T, on outer margins medially 1-2 plumose setae.

Distribution: British Columbia to southern California.

Ecology: From kelp, together with *Volsella* and *Pecten*, from intertidal (washed up with kelp?) to 82m.

Remarks: The second species reported from California, *C. paucidentatus* Barnard, 1952, must be a closely related sibling species with small morphological differences: size is somewhat smaller, the most striking character is the telsonic spination, which shows one strong, but short spine (of half telson length) at the tip of each lobe, and one additional very short spine next to it; Gn2 male and female is asymmetrical with little sexual difference, propodus is similar to *Ceradocus* sp., but broader and defining tooth of palm stronger. There might be an ecological difference, as *C.* sp. comes from "shore under rocks" (Barnard 1952: 58).

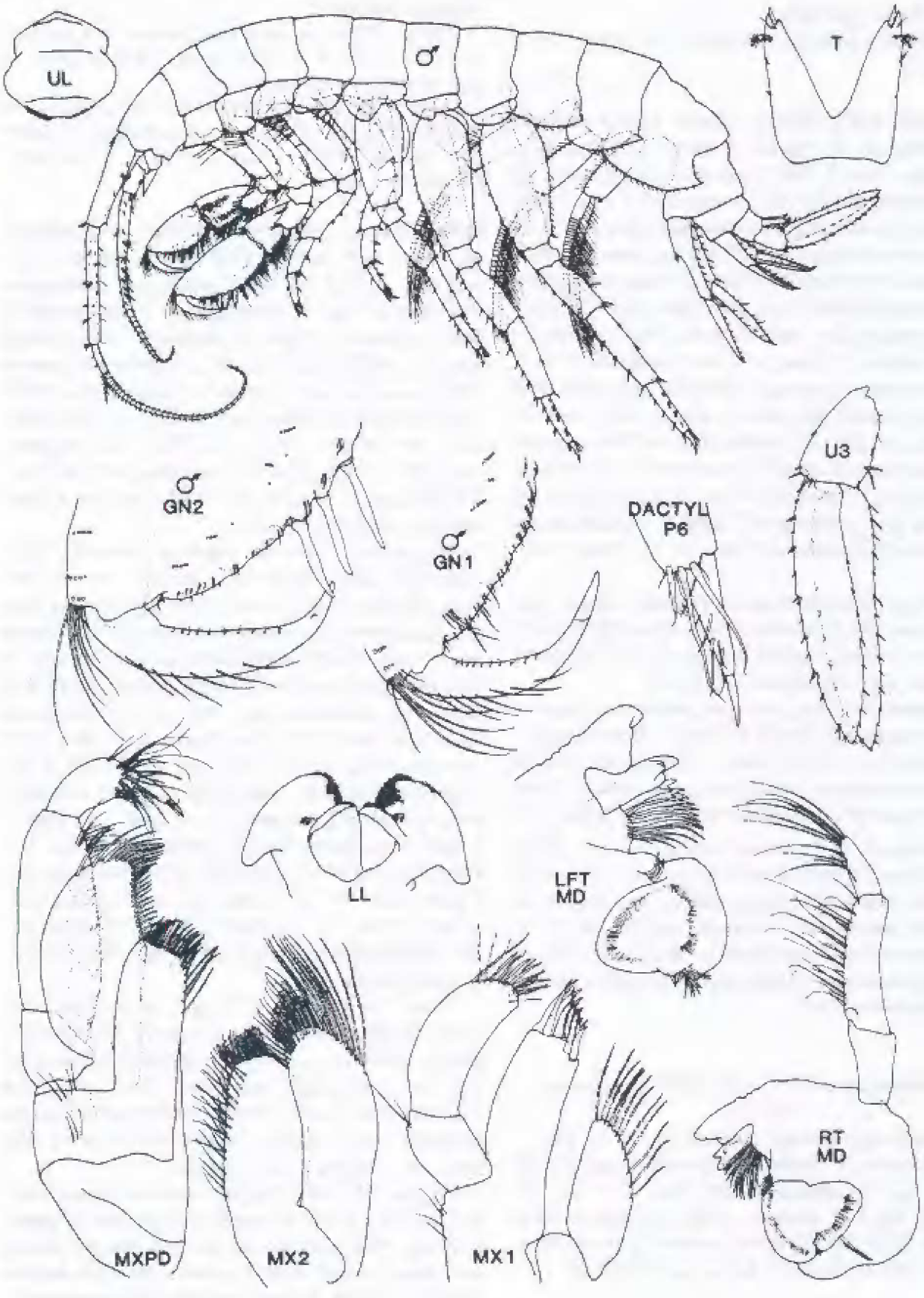

Fig. 14. *Wimvadocus torelli* (Goës) nov comb. Male 29 mm, Cassiar Dist., B.C.

***Wimvadocus* gen. nov.**

Type species: *Gammarus torelli* Goes, 1866: 530, t. 40, fig. 28.

Diagnosis: Body slender, smooth. Lateral cephalic lobe rounded. No traces of eyes. A1 peduncle > flagellum. A1>A2. Mx1 inner plate slender, densely setose about half of inner margin; Mx2 outer plate distoexternal with plumose setae, inner plate with short setae on inner margin and oblique row; lower lip with developed inner lobe; Md palp art 1 long (art1≥art3!), with triangular tooth; Mxp inner plate narrow, distally ending straight, not concave as in many *Ceradocus*. Gn1,2 similar in shape, not much different in size; Gn1,2 carpus < propodus, triangular; propodus hind margins rounded and densely setose, Gn2 palm not defined, dactyli in Gn1 and Gn2 beset with many setae. P5-7 basis narrow-ovoid. U1 peduncle with midfacial strong spine, U3 rami lanceolate, distally pointed, l:b >4, with short spines on all margins. Telson deeply cleft, distally pointed, notched with one strong, short spine.

Etymology: The senior author especially thanks you, Wim Vader, for 3 decades of knowing each other, for countless written or spoken dialogues, for being friend, colleague and "big brother" combined.

Discussion: Originally the type species was reported from cod stomachs (*Gadus morhua* L.) from an Icelandic locality by Goës (1866). Among reasons for eliminating this species from the genus *Ceradocus* are the two types of setae on the outer plate of Mx2, as in *Allocrangonyx* or *Pseudoniphargus*. Also, it differs clearly from *Ceradocus* in the dense series of setae on the outer margin of the dactylus of Gn1 and Gn2 [never present in members of *Ceradocus*, only in both species of *Megaceradocus* (see above)], the lack of eyes (cf. also *Megaceradocus baffini*) and its much more plesiomorphic peraeopods.

***Wimvadocus torelli* (Goës, 1866) nov. comb.**

(Fig. 14)

Gammarus torelli Goes, 1866: 530, t. 40, fig. 28;
Ceradocus torelli Stebbing 1906: 432; Brüggen 1909: 38, pl., fig. 4; Gurjanova 1930: 244; 1951: fig. 523 (repeats fig. 4 of Brüggen 1909); Stephensen 1940: 310, fig. 38; 1944a: 22; 1944b: 106; 1955: 54-55; Shoemaker 1955:54; Vader & Krarup Leth 1990: 59

Type locality: Iceland or Faroes, locality not noted.

Material examined:

USNM 193719, Beach at Point Barrow Base, Alaska, 71°19'N, 156°41'W, L. Wiggins coll., 28 Sept., 1950 - 1 male 50mm (**Neotype**), in alcohol.

CMNC 1999-0008, British Columbia, Cassiar Dist., Alice Arm (55°27'N, 129°33'W), 57m anchor dredge, D. P. Shaw coll., 22 Aug., 1981 - 1 male 29 mm, in alcohol, parts mounted on 2 slides.

Redescription: Body slender, smooth. Head without rostrum, < bodysegment 1+2. Lateral cephalic lobe rounded, defined by short notch and rectangular anteroventral lobe. No traces of eyes. A1 half length of body, peduncle > flagellum, flagellum with 40 arts in neotype, 34 in specimens from B.C. (32 arts in Gurjanova 1951), acc. flag. 5 arts; peduncle art1<art2, art1 with 5 small spines on ventral margin (Gurjanova 1951: without), ratio of arts 1:2:3 = 2:2.5:0.8; A2 peduncle art3:4:5 = 1.5:3:2, gland cone reaching end of art 3, art 4 with 5 groups of setae, art 5 with 7 groups of setae ventrally, flagellum 16-17 arts.

Mouthparts: Upper lip regularly rounded. Mx1 inner plate not triangular as in most *Ceradocus* , but more slender, densely setose about half of inner margin; Mx2 outer plate, distoexternal portion of plumose setae longer than distointernal smooth ones; inner plate with short setae on more than half of inner margin and short setae on oblique row; lower lip with developed inner lobe; Md with large triturative molar, pars incisiva with 3 very shallow teeth; lacinia mobilis, 2 tips with 2 teeth, ca 10 acc. spines; Md palp art 1 unusually long (art1≥art3!), on inner (= ventral) side distally lengthened to short triangular tooth; art 2 densely setose, narrowing distally, art2 : art3 = 2, art3 with 3 longer C-setae and 2 shorter D-setae (B-setae?) sitting marginally, 6 long E-setae distally. Mxp inner plate narrow, distally ending straight obliquely, not concave as in many *Ceradocus* .

Coxae 1,2 subequal in length, subquadrate, Cx1 anterodistally shortly produced to tooth; Cx3,4 clearly shorter than broad, posterior length shorter than anterior one; Cx5 much longer than Cx6,7, which are extremely short. Ep1-3 posterodistal corner somewhat upwards curved, pointed, ventral margin beset with many short spines, evenly rounded .

Gn1 and Gn2 similar in shape and not much different in size; Gn1,2 carpus shorter than propodus, triangular; propodus hind margins rounded and densely setose, Gn2 between setae 3 strong spines, palm not defined (Gurjanova 1951: defined, probably by these spines?), dactyli in Gn1 and Gn2 beset with many setae.

P3,4 similar in size and shape, slender, basis with

long setae on posterior margin, dactyli > half propodus length, simple with separate nail; P5-7 basis narrow-ovoid (Gurjanova 1951: pear-shaped), minutely serrated, proximal a bit wider, posterodistal corner blunt, no posterodistal lengthened lobe, but obtusely shortening. P5 < P6< P7, otherwise very similar.

U1 peduncle with midfacial strong spine, somewhat unequal rami; U2 rami similar to U1; U3 in 29mm spec. < U1, in 50mm U3=U1 (Gurjanova redescribing the material of Brüggen of 61-62mm, reports U3>U1), rami lanceolate, distally pointed, l:b >4, with scarce short spines on all margins.

Telson scarcely longer than U3 peduncle, deeply cleft, distally each lobe pointed, distointeriorly notched with one strong, short spine and 2-3 short setae along outer margins and 1-2 plumose setae disto-marginally. Colour: flesh- pink with hyaline-white on: ocular lobe, mediodorsal parts of all body segments, hind margins of mesosome and metasome, Gn1,2 (anterior margins of propodus and carpus red), P3,4 (merus red), P5-7 (coxa, basis and merus red), Us 1 red, Us2,3 white, U3 distally white, proximal third red, telson white. A1,2 deep red, ventral margin flesh-coloured (Stephensen 1955:55).

Distribution: Circum-Arctic. Matovskij-Gulf, Kola (Gurjanova 1930: 231-248). Gurjanova (1951) reports this species from estuaries and coasts of the northern Atlantic in Iceland, Faerø, West Greenland, Bering or Okhotsk Seas, Novosibirskiye Ostrowa, at depths of 24-240m. Other records include East Greenland (Stephensen 1944a,b, 1955: 106, see also map Fig. 7); Iceland (Stephensen 1935-42, Oldevig 1959); Siberia (Brüggen 1909, Derjavin 1930, Gurjanova 1951); Norway (Vader & Krarup Leth 1990); Gulf of St. Lawrence (Conlan in litt.); here for the first time from the northern Pacific.

Ecology: Shoemaker (1955: 55) writes "littoral-sublittoral, but mainly found deeper down", and reports material from 350-500m from West Greenland, deposited at the Copenhagen Museum. Vader & Krarup Leth (1990: 59) surmise that this species could live in deeply excavated galleries in clayey substrate.

Remarks: During the review of all *Ceradocus* species it turned out that three other genera are closely related, and their species have been for a long time included in the genus *Ceradocus*. These are:

1) *Animoceradocus* Karaman, 1984, with body similar to *Ceradocus* , but dorsally smooth , A1 ped. art 3 l:b= ca 4 (short in *Ceradocus*), Md palp art 1 rounded (vs. toothed); monotypic: *A. semiserratus* (Bate, 1862);

2) *Bathyceradocus* Pirlot, 1934, with metasome and urosome toothed, Cx4 posteriorly excavated, A1 subequal A2, Md palp art1 rounded (vs. toothed), art3 weakly falcate to falcate (vs. slender); with *B. stephenseni* Pirlot, 1934, and *B. iberiensis* Andres, 1977;

3) *Megaceradocus* Mukai, 1978, with smooth body, rostrum or eyes absent; A1 > A2, acc. flag. ca 1/4 of flagellum. Md palp art1 rounded, art3 not falcate, only scarcely shorter than art2, Mx1 IP densely setose, not triangular but slender. Mx2 marginal, but no oblique row of setae. Dactylus Gn2 outer margin with dense setae; with *Megaceradocus gigas* Mukai, 1979 and *Megaceradocus baffini* (Stephensen, 1933) nov. comb.

The deep-sea species *Ceradocus baffini* Stephensen, 1933 (also Stephensen 1944) was more than once surmised to be synonymous with *C . torelli* , as both have setae on Gn2 dactylus outer margin, and are blind and rarely collected deep-water inhabitants. Karaman & Barnard (1979) proposed to move it eventually to the genus *Animoceradocus*, but we find this solution unsatisfactory. It fits perfectly the diagnosis of *Megaceradocus* Mukai, 1978, concerning the matching mouthparts, short A1 acc. flag., similar cephalic lobe, both lacking palm on Gn1,2, propodus Gn1 ovoid rounded, Gn2 carpus longer than wide, many setae on Gn2 dactylus outer margin, P5-7 basis narrowing distally, posterodistal corner right-angled, U1 peduncle with one strong spur-shaped spine medially, one distally; however U3 rami in *Megaceradocus gigas* Mukai, are more robust and much shorter (l:b ca. 4), in *baffini* much longer (l:b >7). The telson in *baffini* is symmetrically shallow-emarginate, whereas in *M. gigas* it is somewhat asymmetrically notched. Thus, we establish for the blind deep-water species *Ceradocus baffini*, recorded at depths from 55m down to 1600m in Baffin Bay, west of Greenland, the new combination *Megaceradocus baffini* (Stephensen, 1933).

SUMMARY

In the course of treating all amphipods found along the Pacific coast of North America, the family Melitidae has been studied in two parts: the *Melita* group in Jarrett & Bousfield (1996) and the *Maera - Ceradocus* group here. Six genera were found in the north Pacific: *Maera* (sensu stricto as well as sensu lato), *Quadrimaera*, *Lupimaera*, *Anamaera*, *Ceradocus*, and *Wimvadocus*. Several new species are described, synonymized or revalidated and poorly described ones redescribed.

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